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First Results at Nyngan Demonstration Farm.

H. J. KELLY.

THE first harvest at the Nyngan Demonstration Farm has been gathered, and, considering the dry season experienced, the results have been very satisfactory. The rainfall for the year was very much below the average. In the autumn, a period of three months occurred in which only 28 points of rain fell; that small quantity was the result of four separate falls. The wheat crop was planted from March to June, but owing to the very dry spell above mentioned, and also to the fact that we were unable to have the land in which were planted the early sowings fallowed for any length of time previous to planting, germination generally did not take place until after a fall of rain totalling 59 points, on the 10th, 11th, and 12th of May. Further rain fell towards the end of May, making a total for the month of 183 points. This gave the crops a good start, and caused a vigorous growth; but, unfortunately, the rainfall for June and July was scanty and very much below the average; and some very heavy frosts were experienced which were rather injurious to the crops. Another rainless period, from the 11th July to the 20th August, proved almost disastrous, but, fortunately, a good fall of rain came at this most critical time, reviving the partly withered crops, and bringing them to the hay stage. A ton to the acre was cut from a considerable area, the total rainfall during its growth being 532 points.

Hay harvesting commenced on the 20th September, and some further rain falling at the end of that month, it was decided to leave for grain a portion of each variety which had done at all satisfactorily, as it is recognised that seed which is raised in dry districts, and especially during a dry season such as the past one, is more likely to produce crops under dry conditions, than seed grown in a cooler and moister climate.

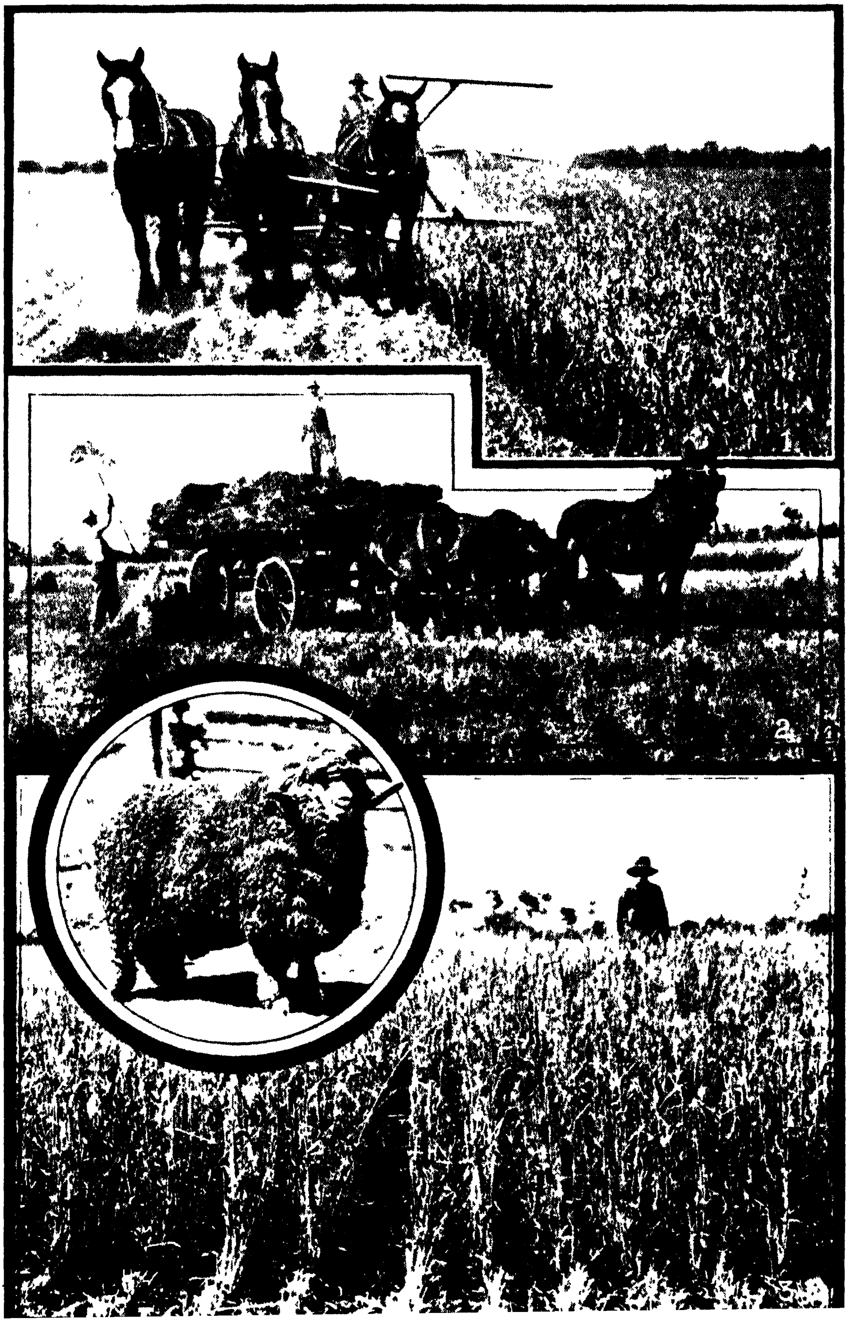
A paddock containing 100 acres was planted as a commercial crop, with five varieties of wheat, viz., Comeback, Federation, Firbank, Bobs, and Warren. Of these, Firbank did the best, both for hay and for grain; Federation did not yield nearly so well as the rest for hay. Of the portions reserved for grain, Firbank produced 10 bushels of good quality grain per acre; Warren, 8·6 bushels; Comeback, 8·1 bushels: Federation, 5 bushels; and Bobs, 4 bushels. The total rainfall during the period of growth was 674 points.

Several varieties of wheat were grown in the Experiment Area in the variety trials and the other experiments conducted, and Firbank, in most instances, came out best there also. Steinwedel was used principally as the check variety, but did not do as well as was expected of it. However, one year's results are not taken as final in any of our experiments, and Steinwedel will be given another opportunity of defending the reputation which it gained for itself at Coolabah Farm.

As before stated, owing to delays in the work of clearing, principally through labour difficulties, we were unable to have the ground fallowed for any length of time before planting. In fact, the experiment paddock, containing 35 acres, was uncleared at the beginning of the year; and as a portion of it was planted on the 24th of March, it can be seen that very little preparation, other than ploughing and breaking down, was possible.

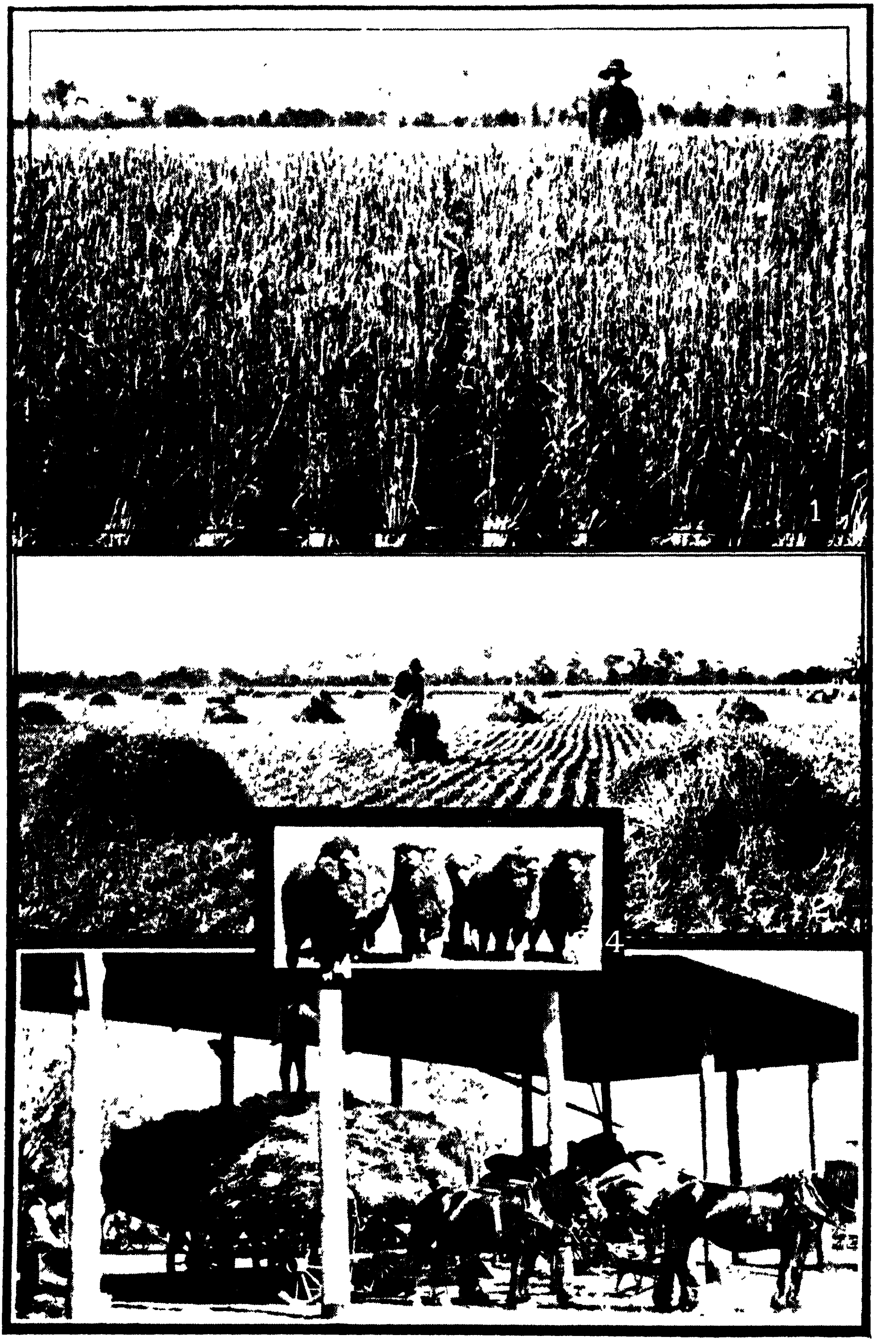
The commercial area had been fallowed for a short period, and, in consequence, the crops grown on it were decidedly better than the experiment area crops. Early fallowing is one of the most prominent factors in the system which we follow and advocate, for only by early fallowing and subsequent cultivation can the moisture from the summer rains (our chief rainfall) be retained in the soil until required for the succeeding crop. The area required for next season's crops at this Farm has been ploughed, some since last July, and is receiving the benefit of a summer cultivation, so that next season's crop will be less speculative, under similar weather conditions, than the past year's has been. An area of 22 acres of rape was planted in April last, and for a time grew very slowly; but after the beneficial rains at the end of August, it made rapid and luxuriant growth, and for two or three months formed a good portion of the diet of 150 sheep. Some cowpeas have also been planted, and, so far, are doing very well.

Rape and cowpeas will form the rotation crops with wheat at this Farm in the system that will be carried out; and farmers in the district will do well to give attention to the cultivation of these fodder crops. Rape is a valuable fodder plant, and one that is very suitable for our western districts, for if planted early (about the end of February or early in March) it will produce a fair amount of nutritious fodder by May, when usually the natural pastures are drying up. At such a time it would be very valuable for lambing ewes, by keeping up the milk supply necessary for the proper development and growth of the lamb. During the year a very fine lot of Merino ewes and a few fine stud Merino rams have been purchased for the Farm, for the purpose of starting a pure Merino flock of a suitable type for the district. These sheep were selected by Mr. J. W. Mathews, Sheep and Wool Expert to the Department of Agriculture, and are certainly a very fine lot, having large frames and wool of great length of staple. About 350 of the ewes averaged, for a twelve months' growth, 13 lb. of wool each. Up to the present the Nyngan district has been regarded wholly as pastoral; but with the advent of more scientific methods of culture, and more suitable varieties of crops, agriculture can at least be brought to greatly assist the pastoral industry, and in this way the living area can be considerably reduced, thus making room for a much larger population. With this object in view, the Nyngan Demonstration Farm was established; and, although, owing to the heavy expenditure necessary for the initial work and equipment, it will be some time before we have a credit balance, yet, if ultimately it be proved by our efforts that a family can be maintained comfortably on a lesser area than at present by minimising the effects of drought through making the soil produce its best from the limited rainfall, the establishment of the Farm will have been justified.



FIRST RESULTS AT NYNGAN DEMONSTRATION FARM.

1. Reaper and Binder at work. 2. Loading Hay.
3. A crop of Firbank wheat. 4. Merino Stud Ram.



First Results at Nyngan Demonstration Farm.

1. A crop of Warren wheat. 2. Stooking.
3. The first load of hay from the Farm. 4. Merino Stud Ewes.

The Production of Pure Seed Wheat and its Improvement.

R. W. PEACOCK, Manager, Bathurst Experiment Farm.

PLANT improvement is of as much importance as animal improvement. Generally speaking, Australians have been busy with the latter, and have in no small measure neglected the former. In successful husbandry, both should have a prominent position. Sheep and wheat are two of the main fundamentals in Australian agriculture, and are worthy of all the best attention that can be bestowed upon them. It is the duty of the farmer to do for wheat what the pastoralist has done for sheep.

Wheat improvement in New South Wales has been left largely in the hands of the professional plant-breeders, and has formed a leading feature in Departmental agriculture. Much has already been accomplished, and the results have been far-reaching. Such Departmental work has its limitations, and it is incumbent on the intelligent farmers to continue the work further than is possible at Government institutions. The Agricultural Department has accepted the production of new varieties and the testing and acclimatisation of standard ones as its business; the adaptation of these varieties to a farmer's local conditions, and improvement by selection, are the farmer's business. The Department is in a position to consider points in the interests of both grower and consumer, and has a more comprehensive objective than the farmer. The farmer is inclined to subordinate many desirable characteristics to that of yield, as the filling of bags is, under the present system of marketing, the main consideration.

The demand for pure seed has been considerable for many years, and the supply is not nearly equal to it. The value of pure, improved seed is daily becoming more recognised. Many farmers have availed themselves of the supplies grown by the Department, and regret its limitations in this respect. The advantages they have obtained they have to some extent passed on by providing seed for their neighbours' requirements. This practice in some measure meets the case; but if the results are to be satisfactory, more than average care and attention must be given to the business to ensure further improvement, and prevent deterioration.

For those who are interested in this question the following notes are written, based upon the practice carried out at this Farm in conjunction with wheat improvement.

Plant improvement rests upon variation and selection. There are no two plants exactly alike—they vary in some particulars. Variation of sufficient importance to warrant selection may be induced by variations in climate and food supply, which comprise such factors as heat, cold, rainfall, methods of culture, time and methods of seeding, manuring, &c.

The most prolific source of variation is cross-breeding. The late Mr. William Farrer produced many of the new varieties so popular to-day by this means. His ideal was very high, and comprised disease-resistance, strength of flour, and prolificness, the latter embracing adaptability to varying conditions.

It is not intended to discuss the question from a professional plant-breeder's standpoint, but rather to take up the work after the breeder has done his part and placed a fixed variety in the hands of the grower. The work is then much simpler, and is the legitimate work of the farmer.

The term "fixed" is but a comparative one, as it has been stated that no two plants are actually alike, and "fixed" is applied to a variety in which the individuals are sufficiently alike for practical purposes.

Owing to variation, it is essential that the improvement of all varieties, or different strains of a variety, should be commenced from a single plant. The practice of going through a crop and picking out the best heads is a great mistake, as these extra large ears may be due to there being but few to the plant, and may lead to the perpetuation of an undesirable characteristic. The best plant should be considered from many standpoints, such as yield, evenness in height of ears, strength of straw, freedom from shattering under adverse conditions, disease-resistance, &c., and should approach as nearly as possible the ideal plant in the mind of the selector.

There are two methods of growing these wheats—in the field and in the plot. In the former case the wheat is grown under ordinary field conditions, and the best plants are selected. These apparently best plants may be stimulated by such factors as increase of room for root-development, manure (horse-dung), extra moisture due to surface conformation, or other factors not sufficiently under control. It is therefore not easy to choose the best plant in the field.

The plot method is much better, as many of the above factors are more under control. From the best individual plant of the previous selection, either from field or plot, 100 of the largest and most perfect grains are selected by mechanical grading with small sieves. It has been proved that the largest and most perfect grains produce the best plants, especially under adverse conditions. These 100 seeds are planted in rows, which are placed 2 links apart, and the grains are placed 1 link apart in the row, which is 1 chain long. This spacing allows of each individual plant being thoroughly examined independently. Prior to harvest the plants are examined, and drastically selected to a high standard of comparative excellence. Any plants which appear constitutionally unfit are pulled up. Such unfitness may be due to disease, difference in nutrition owing to soil moisture, &c., which may not be apparent, and cannot therefore be allowed for.

To ensure against constitutional unfitness and unthriftiness, rigorous selection must be followed, it being better to sacrifice a few good plants than to perpetuate inferior ones. If only one unthrifty plant is left, it will lead to further rejections the following year, or else would perpetuate the defect.

From the plants remaining after culling, the best plant should be selected, and considerable skill is required to select it. This plant should be true to type, and is used for a similar row next season. The remaining plants are harvested together, and the grain graded and sown in a larger plot of one-tenth acre in extent. The rows are drilled 2 links apart, and the grain sown 1 link apart in the rows as before, to facilitate observation and selection. All apparently constitutionally unfit plants are again rigorously culled, and the bulk harvested. This seed is graded, and sown in the field by ordinary methods, upon land which is free from weeds calculated to remain as impurities in the resultant grain, as for instance other varieties of wheat, oats, barleys, ryes, &c. The operations of sowing and threshing are performed by hand and with care, and the seed sown in the field is the progeny from a single plant, and can be guaranteed as pure and true to type.

Throughout the selection in the rows or plots it may happen that an individual plant may vary considerably from its fellows, and if possessing qualities thought desirable to perpetuate, it should be selected and the seed sown separately in a row similar to the best plant selected to perpetuate and retain the original type. If the after behaviour of this variable plant warrants it, it can be perpetuated as a new strain of the original variety, but care should be taken that it differs sufficiently from the original type in some more desirable quality to entitle it to the distinction of an improved strain. This variability may be due to accidental cross-fertilisation, which is rare; but if so, the fact will be strikingly apparent in the next generation, which is the variable one with cross-breds.

The seed from the larger plot of one-tenth acre may be again sown in a larger plot by hand, to again allow of selection, until a comparatively large amount is available for the field. This is carried out on this Farm; but, from a farmer's point of view, the one-tenth acre plot would provide enough seed for a fairly large field block.

After the selected hand-threshed seed from the plot enters upon its field career, it is more difficult to keep it pure and true to type, and it is impossible to guarantee its purity. The seed from the plot is called "Stud seed wheat," and the resultant seed from the field is termed "Wheat of first year from stud plot." The further seed is removed from the stud plots the more likelihood there is of impurity and deterioration. It is, therefore, necessary to have stud blocks, with the system of selection going on continuously, if the best results are to be obtained. These distinctions are worthy of appreciation, and may lead to a demand by farmers for actual stud seed in pounds rather than seed first year removed from stud plots in bushels, the farmer to initiate a continuation stud plot where it would be completely under control, prior to sowing in the field.

The advantages of pure seed are manifold. Seed improved upon the above lines should produce a crop free from other varieties. A crop of mixed varieties may lead to considerable loss. There are so many varieties nowadays with such different characteristics that this trouble has been accentuated.

It is not infrequent to see a crop comprised of four or five distinct varieties, and the writer inspected one having the short-strawed Federation overshadowed by the taller Steinwedel, together with an early maturing variety like Comeback, which was ripe whilst the Purple Straw admixture was still verdant. This crop fortunately was to be cut with a binder, in a climate where shattering is not the rule. If it were stripped, it would be interesting to know how much of the lower Federation would be left whilst the taller Steinwedel was being harvested. Also the farmer would be in a quandary to know whether he should reap the Steinwedel and Comeback as soon as they were ripe to prevent them from shedding their grain, or chance the shedding and wait for the Purple Straw to ripen. Seed saved from such a field and again sown would perpetuate the farmer's worry, and provide evidence of his shortsightedness.

Some of the factors leading to the admixture of varieties in the field are here considered, and will give a slight idea of the impossibility of keeping them even reasonably clean in ordinary farm practice. When only a few varieties were grown, and they were of similar characteristics, the trouble was not so great. Now farmers are realising the advantages of growing varieties of very distinct characteristics to fit in with the different periods of their sowing seasons. Therefore, on most of the farms there are invariably two distinct varieties or more. For instance, Purple Straw, Federation and Bunyip are distinct enough to lead to all the troubles mentioned above when nicely mixed. In field practice the mixing may be brought about by not cleaning the harvesting machinery thoroughly before commencing another distinct variety. Threshing machines may bring grains of one farmer's varieties to mix with another's. Seed drills, unless thoroughly cleaned, may mix varieties rather badly. Heavy rains may cause the soil with its seed to be washed on to the soil of another variety between the period of sowing and germination. Birds frequently carry seed from one plot to another. Ants will do the same. Seeds of other varieties may be distributed in the dung of the horses used to prepare the land, if fed on wheaten hay sufficiently matured to allow of seeds forming. Stock grazing on the stubbles may carry grain from one paddock or portion of a paddock to another, and may foul fallowed areas. High winds may blow sheaves from stooks of one variety to those of another. Sparrows and other birds carry grain from one stook to another. Men carry grains about on their clothes when working amongst different varieties. Vehicles used in harvesting may bring about the same results. Fodder crops grown in rotation may be a source of fouling the ground, unless prevented from seeding the previous season. It will be seen that eternal vigilance is required to keep the varieties reasonably pure, and as a means to this end hand-picking must be adopted.

The pulling out of stray plants by hand is a necessary though tedious operation, and should be commenced early in the season. Throughout the winter months some varieties may be recognised by their different habits, such as more erect growth, colour, &c. Whenever possible these differences should be availed of at this time. Later on, when they are beginning to head, very early varieties can easily be selected from later ones. Every opportunity should be taken during any period where differences are apparent, as it is extremely tiring and well-nigh impossible to select all stray plants from a field of ripening grain. Where the admixture is great, it is preferable to go thoroughly through a small area, and exercise care in keeping the grain from it as pure as possible throughout the threshing, grading, and sowing operations.

It should be apparent from the above that varieties grown in field practice are liable to get mixed; that when mixed the trouble is difficult to rectify, and if allowed to go very far must lead to considerable loss. The only remedy is to go to a source for seed which has been selected, improved, and grown upon correct lines. Such sources should be more plentiful than at present, and situated in every district possessing distinct climatic and other characteristics. Such seed should be obtainable from the progressive farmers of any district, and their neighbours should not begrudge the extra price asked for the unquestionable trouble involved in producing seed which should add considerably to their average yield per acre.

The improvement of wheat is not possible by haphazard, desultory methods, and is based upon the selection of the best plant, rigorous selection of its progeny whilst in the field, the selection of the best grains by mechanical grading, and the following of cultural methods which favour improvement rather than deterioration. By some farmers a change of seed is considered desirable, and such has much to commend it when deterioration has been allowed. When methods have been followed to ensure improvement, a change of seed is not necessary, and better results are obtained from seed grown and improved as above than by a change from other districts. The adaptability to local conditions is a very important factor in increasing the average yield per acre throughout the State.

WHEAT RAINFALL MAP OF N.S.W.

THE Commonwealth Meteorologist has issued a map of New South Wales, showing the quantity and distribution of the average rainfall during the wheat-growing period, April to October inclusive, at various stations throughout the State. The map is shaded to show the portions of the State receiving under 10 inches, 10 to 20 inches, 20 to 30 inches, and over 30 inches during this period. Lines show the percentage of the annual rainfall which falls during the period. For example, only 50 per cent. of the annual average rainfall is received during these months in the Moree and other Northern districts, whilst in Riverina 60 per cent. and over is recorded during the same period.

A similar map, taking in Victoria and Riverina, is on the same sheet. Copies of these interesting maps may be obtained from the Divisional Officer, Weather Bureau, Sydney. Price, 1s. for the two.

Thistles in Crops.

THIS is a subject that has agitated the minds of farmers for many years, and which, each succeeding year, becomes more serious. So far the efforts of the farmers have been confined to eradicating the pest, but until lately they have given little consideration to nullifying the effects of the thistles which they have failed to eradicate, and which have become more than a serious nuisance in their ripe crops. The usual course has been, if the thistles were not too numerous, to have men cutting them out in front of the harvester: or, if they were too thick to be thus dealt with, to abandon the crop. However, these practices bid fair to become obsolete owing to the invention of a farmer in the Grenfell district. This man, Mr. L. N. I'anson, is a share-farmer on the Iandra Estate, and last year he sowed a crop of wheat in an old thistly paddock. The crop was put in late, and the thistles beat it. They were chiefly star thistles, and a few black ones, and so thick were they that to make hay was impossible, and it was decided to attempt to strip. This, also, was found impossible, owing to the fact that the combs of the harvesters became clogged with thistles, and it became necessary to abandon the crop altogether, although it appeared capable of a fair yield. Mr. I'anson was loth to do this, and set himself to think of some contrivance by which the combs of the harvesters could be made to miss the thistles without missing the grain. The result was that he fixed a bar, from which long prongs projected in front of and above the comb of the harvester. These prongs, which were far enough apart to allow the heads of wheat to pass in between and be gathered by the comb, but were sufficiently close to catch the thistles, were worked by a lever, and were kept pointing forward above the crop when a clean patch was being traversed; but on coming to a thistly patch they were lowered and pointed backward beneath the comb. Thus, while every grain of wheat was gathered, the thistles were pushed down beneath the comb and passed over. Owing to this invention Mr. I'anson, instead of having to abandon his crop, stripped 16 bushels to the acre.

The efficacy of the invention having been thus demonstrated, he was advised to patent it by a neighbouring farmer, Mr. E. E. Southwell, of Greenethorpe, who all along had taken great interest in the experiments, and he did so. The news of his success having got about, he found himself besieged with inquiries and orders to such an extent that he took Mr. Southwell into partnership solely to deal with the correspondence. These men have proved themselves real benefactors to the farming community, as anyone must realise who has seen a harvester or stripper go through a dense bed of thistles without taking up one, and without missing a head of wheat. As with most useful inventions, the most surprising thing is that no one thought of so simple a contrivance before.

The Germination of Wheat.

MARK H. REYNOLDS, Inspector of Agriculture, Western District.

DUE to scientific research, agriculturists are contantly being enlightened in many problems, making success more certain. Some there are who still deny that the application of scientific knowledge to the practice of farming has benefited them for the past twenty years. Others follow in the footsteps of their forebears, and are apparently blind to improved methods. The majority, however, recognise and apply in practice many of the improvements suggested from the work of the scientific investigator.

There are few of our farmers who initiate improvements. Perhaps this is because a successful farmer must be, first of all, a business man, and it is only in a few instances where the experimenter and the money-maker combine in the one person. Most farmers prefer somebody other than themselves to demonstrate anything that is in the purely experimental stage, and they prefer that the test be made under their own climatic and other conditions.

Perhaps of the many problems upon which research has thrown light, the germination of seeds is the one which has least influenced the farmer. To the student the germination of wheat, when treated with different fungicides, has considerable interest; this and other ways in which the germination of wheat is affected should be of very live interest to the farmer.

One has only to inspect different wheat areas to notice many instances of poor germination and weakly plant-growth. At different centres, at meetings of the Agricultural Bureau, I have discussed this matter with farmers, and have suggested certain simple procedure. The limited time available for investigating this matter does not enable me to do more than place a few simple suggestions before farmers as to the cause of poor germination in wheat.

Causes of Low Germination of Wheat.

Injury is the chief cause of grain not germinating. This injury may be caused while the grain is still in the ear—(1) By fungoid infection; (2) by low temperature. I do not intend to discuss the former of these, mainly because farmers generally reject disease-infected wheat for seed purposes.

Damage by Frosts.

At one time or another light rain falls late in the afternoon or evening, leaving a clear sky before the dawn. At times white frosts are noticed the following morning. If such conditions occur when the grain is in the ear a portion of it will certainly be damaged by frost. On investigation of the grain under a low-power microscope it will be noticed that the skin of the grain is often cracked, and in a rough bran-like condition, even about the germ.

The damage done by late frosts, without the grain having been previously moistened by rain, is also considerable, especially in patches in the field—

that is, so long as there is an appreciable amount of moisture in the grain. I should say that the nearer maturity the grain is the less it is liable to damage by frost, although I have not investigated this point.

Effect of Fungicides on Frosted Wheat.

When the skin of the grain is not damaged the effect of fungicides, such as bluestone and formalin, when in weak solutions, is very slight, and is chiefly on the vitality of the young plant; but if the skin of the grain is broken the effect on the germination is often severe. In tests made of frosted grain, as much as 30 per cent. less grain germinated when treated with bluestone.

Damage caused in the Harvesting and Handling of the Grain.

With the machinery available to harvest the grain, an appreciable amount is either cracked or bruised. With the grading machinery now used the cracked and small grains are easily removed, and as the value of grading is somewhat generally recognised no further comment is necessary, for the cause of the thinly-clothed wheat fields cannot be attributed to bruised grain.

Sowing in Dry Seed-beds.

Undoubtedly, even where the whole of the wheat is capable of germinating, there are conditions of the soil which either prevent a percentage of the grains from germinating, or cause the plants to die after germinating.

When there is no appreciable moisture showing in the surface 3 inches of the soil, the grain will generally lie dormant until a sufficiency of moisture is added to the soil from outside sources. Good seed treated with formalin, and sown in a dry seed-bed, loses its germinating properties if moisture is long absent.

At times there is just sufficient moisture to induce activity, but not enough to enable the young plant to attain sufficient stem and root growth to lead an independent existence—a state known to farmers as "malting." Each season in one locality or another a considerable percentage of grain is lost in this way.

It is known that in different soils the percentage of moisture available for plant-use varies considerably. The farmer should ascertain the minimum amount of moisture necessary for satisfactory germination. On this matter Senator McColl states that in the semi-arid portions of America the farmers, before sowing, weigh a small average sample of the soil in which the seed is to be sown, and then transfer it to an ordinary oven. After baking it is cooled and again weighed. If less than 10 per cent. loss of weight occurs they do not sow. The loss is calculated as water driven off. Of course, the method is crude, as substances other than water are driven off; but it is sufficiently accurate for their purpose. As previously stated, 10 per cent. may not be sufficient with certain soils, but by observation quite a satisfactory result could be obtained in this way.

Sowing in Loose, Open Soils.

Where the soil is roughly cultivated, and the seed is sown in such open soil, there is less germination than in a soil where the seed is well covered, and the condition of the soil favours the development of the young plant. Again, if the soil is too finely cultivated, and after sowing, but before the plants show, the rain beats the surface into too compact a condition, a loss also occurs.

Sowing the Proper Depth.

When the moisture condition of the soil is favourable to germination the grain should be sown between 2 and 3 inches deep; towards the 2 inches in clayey soils, and towards the 3 inches in friable sandy soils.

By sowing shallow, the grain on swelling may be damaged in the winter by frosts. By sowing too deep at any time the young plant may exhaust its vitality before it reaches the light, enabling it to take on an independent existence. From this it will follow that care displayed in preparing a suitable seed-bed, and sowing with suitable machinery, is well repaid. A soil too loosely packed would be improved by harrowing, and the operation of drilling further improves the condition of the soil. The shoe-drill would, no doubt, be useful under such conditions.

Insect Damage.

In this State, the damage by insects to the grain when stored and in the soil is slight as a rule. Seasons occur, however, when the damage is somewhat more serious.

Weevils were very prevalent in stored grain from 1910 harvest, but where such affected grain is sown the farmer generally increases the quantity sown to make up for the loss occasioned by the insects. Damage has also been noted by grubs and other insects in the soil, but loss from this cause is not widespread.

Whenever there is more than one factor contributing to a result, it is difficult to place one's finger on the factor most concerned, unless the different factors can be separated and their individual effects noted.

This matter of the cause of poor germination is puzzling to more than one farmer, because they only have time apparently to look at the result, and no time to investigate the cause. Generally the blame is attributed to the moisture-content of the soil being deficient.

A little Light on the Subject.

The yielding qualities of the one or more varieties of wheat grown in any locality influence the farmer in the choice of variety for next sowing. If he has the favoured varieties he puts aside a quantity for himself, and usually sells a further quantity as seed to his neighbours. The remainder goes to the mill.

His wheat for seed is generally recleaned or graded, and at seeding time, or before, a considerable portion is pickled. Bluestone or formalin are the two most used fungicides. The seed is then sown, often with poor germination results.

I would suggest that before deciding to keep any wheat for seed a germination test be made of the unpickled grain, when it is to be sown unpickled; and when pickling is decided on, then let the farmer take a small portion of each of the wheats he purposes sowing, pickle them in the ordinary way, and give the small samples the same time to dry as the bulk stuff requires. Then count out, without discrimination, two lots of 100 or 200 grains from each variety, place a damp cloth or flannel under and over the grain, set it on a shelf, and moisten it from time to time. Examine and count the germinated or non-germinated grains a fortnight later, and obtain the percentages.

A germination test which I lately carried out will illustrate results to be looked for. The grain had been treated with bluestone and lime. Result:—

46 per cent. of good, vigorous germination; 10 per cent. of these seeds were slow in germinating.

9 per cent. weak germination—poor vitality grain.

2 per cent. started germination but died.

43 per cent. did not germinate.

Good, vigorous germination is known when the stem portion of the plant comes directly away from the germ end of the wheat without pushing under or breaking the skin of the food portion of the grain.

Grain which does not germinate is generally attacked by fungi, either blackening or covering the grain with greenish mould, and when in the soil is a source of danger in that it attracts grain-eating insects.

Weak germination, showing poor vitality, is noticed when the stem portion of the plant either runs directly under the skin of the grain or bursts it in places. In most instances the young plants will be found with less growth and weaker generally than where the stem comes away clean. A percentage of such plants in a field causes a considerable reduction in the yield.

Grains which germinate, but are too weak to produce plants, will be found with the stem portion of the plant underneath the skin of the wheat, but dead.

This instance of a germination trial will tend to show what a farmer may expect. It is not an uncommon instance, for during the last three seasons other tests have laid the chief blame of poor germination in the field, to injury to the grain not observable to the naked eye, although when one knows from observation that the grain has a broken skin it can be felt by rubbing between the fingers. No doubt continued tests by feeling would enable anyone to locate a damaged sample, of course taking into account the peculiarities of any one wheat and the weather conditions during development.

Conclusion.

By some such simple means of ascertaining the germinating properties of wheat a farmer could discard for seed any sample with a low germinating percentage; certainly anything under 70 per cent. Such grain should go to the mill. By making his test early, in the case of his wheat being faulty, he would have time to secure a good sample before seeding time. I feel sure his neighbours would appreciate his trouble. Knowing, then, how many plants to expect from the seed sown, he can definitely conclude, should poor plant showing occur, that the cause was other than faulty germinating properties of the grain, for with this factor he is working in the light.

Field Experiments with Wheat.

COWRA EXPERIMENT FARM.

V.—A MANURIAL TRIAL; and VII.—A HARVESTING TRIAL.

F. DITZELL, Acting Manager.

As these two experiments go hand in hand, the results obtained from them are dealt with in the one report.

Experiment VII.

Object:—To determine the effect upon the succeeding wheat crop—*i.e.*, upon the fertility of the soil—of the different methods of dealing with the straw after the grain has been harvested. Briefly, this experiment determines the relative merits of the different methods of harvesting as practised by our farmers.

This experiment is divided into three sections, so that comparisons can be made under different conditions of growing wheat, viz. :—

Section 1.—When wheat is grown each year on the same land ;

Section 2.—When wheat is grown in alternate years on the same land, a fodder crop being grown in other years ; and

Section 3.—When wheat is grown in alternate years on the same land, the land in other years being bare fallowed.

Each section is in turn divided into three blocks, which are compared with one another, and in which (1) the straw is burnt, (2) the straw is removed with a reaper and binder, and (3) the straw is ploughed under. The first block represents the practice of harvesting with the stripper and burning off the straw ; the second, the practice of harvesting with the reaper and binder ; and the third, the practice of harvesting with the stripper and ploughing in the straw.

Each section is thus subdivided into three blocks. Sketch A shows the arrangement of the sections, and Sketch B the arrangement of the blocks and the manner in which they are harvested.

A comparison of the results obtained in each section will furnish information as to the most suitable system of growing wheat in this district—*i.e.*, whether wheat grown each year on the same land, or in alternate years in conjunction with either bare fallow or fodder crops, is the most profitable.

Experiment V.

Object:—On each of the blocks mentioned above a manurial trial is conducted to ascertain the chemical needs of the soil, under the different rotations and methods of harvesting practised, by the effect upon the yield of the wheat crop of the continued application of simple and mixed fertilisers or no fertiliser at all to the same land. Each block is divided into plots, which are manured as in Sketch C.

Sketch A.

Arrangement of sections.

SECTION 1.	Wheat every year.	
SECTION 2.	Wheat and fodder crops in alternate years.	*These two subsections are cropped with wheat alternately.*
SECTION 3.	Wheat and bare fallow in alternate years.	*These two subsections are cropped with wheat alternately.*

Sketch B.

Arrangement of blocks.

BLOCK 1.	Harvested with Stripper. Straw burnt.
BLOCK 2.	Harvested with Stripper. Straw removed.
BLOCK 3.	Harvested with Stripper. Straw ploughed in.

Sketch C.

Arrangement of Plots.

PLOT 1.	No manure.		*Check Plot.*
PLOT 2.	Sulphate of Ammonia ... Superphosphate	60 lb. per acre. 90 ,, ,,	
PLOT 3.	Superphosphate	90 lb. per acre.	
PLOT 4.	Sulphate of Potash ...	30 lb. per acre.	
PLOT 5.	No manure.		*Check Plot.*
PLOT 6.	Sulphate of Ammonia ...	60 lb. per acre.	
PLOT 7.	Sulphate of Ammonia ... Sulphate of Potash ...	60 lb. per acre. 30 ,, ,,	
PLOT 8.	Superphosphate ... ... Sulphate of Potash ...	90 lb. per acre. 30 ,, ,,	
PLOT 9.	Sulphate of Ammonia ... Superphosphate ... ... Sulphate of Potash ..	60 lb. per acre. 90 ,, ,, 30 ,, ,,	
PLOT 10.	No manure.		*Check Plot.*
PLOT 11.	DIVISION.		

WHEAT EXPERIMENTS Nos. V and VII, COWRA EXPERIMENT FARM, 1907, 1908, 1909, and 1910.

These experiments have been carried out in accordance with the above general directions.

Rotations and Cover Crops.

The rotations adopted are explained above, namely:—In Section 1, wheat every year; in Section 2, wheat in alternation with fodder crops; and in Section 3, wheat in alternation with bare fallow.

The fodder crops grown in connection with Section 2 have been, during the various years, as follow:—

1906—Black tares.
1907— ,,
1908—Rape.
1909—Black tares.
1910—Rape, which was destroyed by the depredations of caterpillars, necessitating resowing with Skinless Barley.

These fodder crops were never fed-off as a whole, but were always ploughed in. It would have been permissible to feed-off each plot separately.

Blocks Required.

The number of blocks required were as follow:—

In Section 1, where wheat is grown each year on the same land, one set of three blocks, namely, G IX, X, and XI.

In Sections 2 and 3, in which wheat is grown alternately with fodder crops and bare fallow respectively, two sets each of three blocks. In Section 2, B II, III, and IV were cropped with wheat in alternation with F VII and VIII and C VIII, the former being cropped in 1907 and 1909, and the latter in 1908 and 1910. In Section 3, B V, VI, and VII were cropped with wheat in alternation with F IX, X, and XI, the former being cropped in 1907 and 1909, and the latter in 1908 and 1910.

Treatment of Land prior to Planting Wheat.

The land was cleared and broken up in 1906, and prior to the commencement of these experiments the land required for each section was cropped for one year uniformly with wheat, namely:—In G IX, X, and XI, Blue Federation; in F VII, VIII, IX, X, and XI, and G VIII, Plover; and in B II, III, IV, V, VI, and VII, Schneider. This treatment was such as would tend to make the land for each section uniform and even.

Preparation of the Land.

As soon as possible after the wheat grain was harvested, the straw on Block II in all sections was cut with a reaper and binder and removed. The straw on Block I was then burnt. After this was done, the land in Sections 1 and 2 was disc-ploughed about 5 inches deep, in accordance with a plan which ensured that all the ridges and "clean-out" furrows were located at the boundaries of the plots or on the divisions, as soon as possible, and immediately harrowed down to a fine tilth in readiness for sowing the succeeding crop.

Section 1 was then sown with wheat during the latter half of the sowing season.

Section 2 was sown with a fodder crop as soon as seasonable. The fodder crops which were grown are enumerated under "Rotations and Cover Crops."

Section 3 was allowed to remain undisturbed until early spring, when it was disc-ploughed about 5 inches deep, in accordance with a plan which ensured that all the ridges and "clean-out" furrows were located at the boundaries of the plots or on the divisions.

In Section 2, the fodder crop was ploughed under in the spring, the ploughing being similar to that on Section 3. Unless special circumstances, *e.g.*, excessive weed growth, required otherwise, the ground in Sections 2 and 3 was left as ploughed until the succeeding wheat harvest was over. The ground was then cultivated in a uniform and thorough manner so as to maintain a loose mulch of dry earth 2 to 3 inches deep, and to destroy all weed growth. The ground was not reploughed before planting wheat, but when necessary it was freshened or loosened by cultivation.

Prior to 1908, the cultivation was done with a spring-tooth cultivator and harrow; since then the one-way disc cultivator has almost entirely taken the place of the former implement.

The above is an outline of the ploughing and cultivation that was given to each section since the commencement of these experiments in 1907. Of course, in Sections 2 and 3 the two series of blocks for each that were in use were worked in alternation, thus giving an experiment crop of wheat every year.

Planting the Wheat Crop.

Just prior to planting, each block was measured out and pickets were placed to indicate the position of the line. From 1907 to 1909 the line was run out by a hand-marker, and in 1910 by a marker on the drill, which the drill-wheel had to follow in sowing each plot. In F and G series the plots are 975 links long and 16 links wide, to allow of one drill width being sown. In B series the plots are 500 links long, and are 29·3 links wide to allow of two drill widths—*i.e.*, one round—being sown.

The seed for all the plots was then treated uniformly for the prevention of bunt (stinking smut) in the succeeding crop, with the fungicide calculated to give the most satisfactory results. The bluestone and lime-water treatment was used in 1907, 1908, and 1909, and the bluestone and salt treatment in 1910. The latter treatment has since been discontinued, and the former one is in use again.

The varieties of wheat sown in the different years were as follow:—

1907, Section 1, Bunyip; Sections 2 and 3, Comeback.
1908, 1909, and 1910, Bunyip was sown in every section.

The planting was uniform for all the plots, which were all sown at the same rate per acre, namely:—

1907, 43 lb. of Comeback, or 36 lb. of Bunyip. 1909, 42 lb. of Bunyip.
1908, 42 lb. of Bunyip. 1910, 36 lb. of Bunyip.

They were also sown at the same regular depth, and at the same time—*i.e.*, on the same day or two successive days, or two days as close together as the weather would permit.

As it was desirable that all sections should be planted at the same time, the planting never took place earlier than the middle of the planting season—the middle of May—in order to allow a reasonable time in which to properly prepare the land on which wheat is sown each year—Section 1.

Fertilisers.

As stated in the general directions above, each block is subdivided into eleven plots, composed of ten plots for comparative purposes, and one division for convenience in harvesting and cultivation. These plots were all manured in accordance with Sketch C. These fertilisers were applied to the wheat crops only—*i.e.*, directly with the wheat in each case; no fertiliser was applied to the cover crops where such were grown. The fertilisers were distributed evenly and uniformly on the plots. This was done by using a drill with a fertiliser attachment or distributor. To facilitate an even distribution, each fertiliser was increased in bulk by the addition of dry sand—a non-fertilising material—and also to such a bulk (found by actual trial) as would allow all the fertilisers to be sown by the same speed-gear or speed-rate of the fertiliser distributor.

After Cultivation.

The ground was harrowed after planting the seed to ensure proper covering of the seed, and to level the ground by filling in the drill wheel-marks. During its growth the crop was harrowed whenever sufficient rain fell to form a crust on the soil, and this practice was continued, if necessary, until the crop shaded the ground.

Harvesting.

The portions of the plots harvested for comparison were taken from the centre of each plot, the ends, which were likely to cause variations as the result of influences outside the plots, being cut off and rejected. The portions of the plots thus harvested for comparative purposes were reduced to such an area as would permit of easy computation, but they were not reduced more than was absolutely necessary to comply with this condition.

The crops on all the plots were stripped in a uniform manner.

Results.

The results of these experiments for the years of 1907, 1908, 1909, and 1910—*i.e.*, from the commencement of the experiments—are given in the tables that follow.

The "Natural" and "Percentage" yields were fully explained by Mr. Sutton in the last February *Gazette* under "Tillage Experiments with the Plough," on page 167.

In some instances slight differences might be noticed in the "average percentage" yields. The "average percentage" yields are obtained by adding up the "yearly percentage" yields and dividing by the number of years; the "average bushel" yields are obtained by adding up the "yearly bushel" yields and dividing by the number of years. Since all the calculations are only worked out correctly to the second decimal place, it is plainly apparent why there are, in some instances, slight differences between the "average percentage" yields as obtained and the percentages which would be obtained by calculation from the "average bushel" yields.

Tables I, II, and III give the results obtained from each individual plot during the progress of these experiments. It will be noticed that Table I gives the yields obtained from Section 1, or wheat every year on the same land; Table II, the yields from Section 3, or wheat in alternate years on the same land, the land in other years being bare fallowed; and Table III, the yields from Section 2, or wheat in alternate years on the same land, a fodder crop being grown in other years. Each table is then divided into three sub-tables (*a*), (*b*), and (*c*), representing different methods of harvesting, in which (*a*) represents the crop stripped and straw burnt off; (*b*) the crop stripped and straw afterwards removed with reaper and binder; and (*c*) the crop stripped and straw afterwards ploughed in. Each of these sub-tables gives the yields from seven plots manured with either sulphate of ammonia, which supplies nitrogen; sulphate of potash, which supplies potassium; or superphosphate, which supplies phosphorus, either singly or in combination. These are compared with the yields of three plots not manured at all.

In order to illustrate more clearly the results obtainable from the different conditions under which wheat is grown, the different methods of harvesting practised, and the various fertilisers used, Tables IV, V, and VI have been prepared. Each of these tables is a summary prepared from Tables I, II, and III.

Table IV shows the results obtained from the different methods of harvesting employed under each of the conditions of growing wheat. In each sub-table IV (*a*), IV (*b*), or IV (*c*) the yield from the method of harvesting giving the lowest return has been taken to represent 100, and the yields obtained from the other methods of harvesting have been expressed in proportion to this. Taking the "average yield in bushels" and the "average percentage yield," both for the whole time the experiment has been in progress, as a basis for comparison, it will be seen that the results obtained from the different methods of harvesting in each sub-table, or in each section, are, in order of merit, as follow:—

	Average Yield in Bushels.	Average Percentage Yield.
Table IV (*a*).—Wheat every Year.		
(1) Straw burnt	22·78	120·55
(2) Straw ploughed in	20·88	110·64
(3) Straw removed with reaper and binder	19·27	100·
Table IV (*b*).—Wheat in alternation with Bare Fallow.		
(1) Straw ploughed in	28·07	104·6
(2) Straw removed with reaper and binder	27·66	102·1
(3) Straw burnt	27·07	100·
Table IV (*c*).—Wheat in alternation with Fodder Crops.		
(1) Straw burnt	28·72	102·03
(2) Straw ploughed in	27·97	100·42
(3) Straw removed with reaper and binder	27·97	100·

It is, therefore, seen that in the section where wheat is grown every year there is a considerable difference in the yields, due to the methods of harvesting practised, but in the other two sections the variations are negligible.

Table V illustrates the results obtained under the different conditions of growing wheat, and is divided into three sub-tables—(*a*), (*b*), and (*c*)—referring to the different methods of harvesting. Under each system of harvesting the yields from the section where wheat is grown continuously, and which are in every instance the lowest, are taken to represent 100, and the yields given by the other systems of growing wheat have been expressed in proportion to this.

Again, taking the "Average yield in bushels," and the "Average percentage yield," for the whole time the experiment has been in progress, as a basis for comparison, it will be seen that the results obtained from the different conditions under which wheat is grown, are, in order of merit, as follow :—

	Average Yield in Bushels.	Average Percentage Yield.
Table V (a).—Straw burnt.		
(1) Wheat after a fodder crop	28·72	125·57
(2) Wheat after bare fallow	27·07	118·24
(3) Wheat every year	22·78	100·
Table V (b).—Straw removed with reaper and binder.		
(1) Wheat after a fodder crop	27·97	150·96
(2) Wheat after bare fallow	27·66	147·5
(3) Wheat every year	19·27	100·
Table V (c).—Straw ploughed in.		
(1) Wheat after a fodder crop	27·97	134·5
(2) Wheat after bare fallow	28·07	134·35
(3) Wheat every year	20·88	100·

It is, therefore, seen that under the first two methods of harvesting given above, the wheat after a fodder crop has given the best yield, being closely followed by wheat after bare fallow for second place, both of these being much in advance of wheat every year. In the last-mentioned method of harvesting, where straw is ploughed in, the results from wheat after a fodder crop and bare fallow, respectively, are practically the same, and both are much in advance of wheat every year.

Table VI shows clearly the effects of the different fertilisers under each condition of growing wheat. The average yield of the three plots, one for each of the methods of harvesting practised, which are manured with the same fertiliser under each condition of growing wheat, has been given in the Table as the result from the fertiliser and the condition of growing wheat in question.

As a basis for comparison, the yields from plots which receive no fertiliser—*i.e.*, check plots—are taken to represent 100, and the yields obtained from the different fertilisers are expressed in proportion to this.

Reference to the Table will show that in neither the wheat after bare fallow, nor wheat after a cover crop, have the various fertilisers had any important effect. Of course, the land on which these experiments are planted is new yet. After a few more years of cropping, certain fertilisers will probably exercise an important effect upon the yield. In the section where wheat is grown every year the various fertilisers have had an important effect upon the yield. The following are the fertilisers used in this section, arranged in order of merit, taking the "Average percentage yield" as a basis for comparison:—

Table VI (a).—Wheat every year.	Average Percentage Yield.
(1) Sulphate of Ammonia, Superphosphate, and Sulphate of Potash ...	140·78
(2) Superphosphate and Sulphate of Potash	138·05
(3) Sulphate of Ammonia and Superphosphate...	133·13
(4) Superphosphate..	125·48
(5) Sulphate of Ammonia and Sulphate of Potash	108 2
(6) Sulphate of Potash	103·54
(7) Sulphate of Ammonia	97·19

It will be noticed that those fertilisers, or mixtures of fertilisers, containing superphosphate have given the best results, and that although sulphate of potash when used alone has not increased the yield to any extent, and similarly used sulphate of ammonia has decreased the yield, yet both these fertilisers when used in conjunction with superphosphate have considerably increased the yield over and above that obtained from superphosphate alone.

In conclusion, it must be stated that experiments such as these require carrying out over a long series of years before really valuable results can be obtained, and that too much reliance must not be placed upon the results obtained to date.

TABLE IV.—AVERAGE YIELD OF 10 PLOTS UNDER DIFFERENT METHODS OF HARVESTING.

(*a*) *Wheat every Year.*

Series G, Blocks IX to XI.

Year.	No of Years.	Variety, &c	Crop stripped and straw afterwards burnt. Yield.				Crop stripped and straw afterwards removed with reaper and binder. Yield.				Crop stripped and straw afterwards ploughed in. Yield.			
			Per acre.		Percentage.		Per acre.		Percentage.		Per acre.		Percentage.	
			Computed Bus.	Average Bus.	Yearly.	Average.	Computed Bus.	Average Bus.	Yearly.	Average.	Computed Bus.	Average Bus	Yearly.	Average.
1907	1	Bunyip	23·03	23·03	116·4	116·4	19·78	19·78	100	100	20·26	20·26	102·4	102·4
1908	2	,, ...	20 18	21·60	97·8	107·1	20·64	20·21	100	100	19·48	19·87	94·4	98·4
1909	3	,, ...	28·55	23·92	121·9	112·0	23·42	21·28	100	100	25·83	21·86	110·3	102·4
1910	4	,, ...	19·36	22·78	146·11	120·55	13·25	19·27	100	100	17·95	20·88	135·47	110·64

(b) *Wheat after Bare Fallow.*

Series and Blocks, B V to VII, and F IX to XI.

Yield.	No of Years.	Variety, &c.	Crop stripped and straw afterwards burnt. Yield.				Crop stripped and straw afterwards removed with reaper and binder. Yield.				Crop stripped and straw afterwards ploughed in. Yield.			
			Per acre.		Percentage.		Per acre.		Percentage		Per acre.		Percentage.	
			Computed Bus.	Average Bus.	Yearly.	Average.	Computed Bus.	Average Bus	Yearly.	Average.	Computed Bus.	Average Bus.	Yearly.	Average.
1907	1	Comeback	32·53	32·53	100	100	34·51	34·51	106·1	106·1	32·45	32·45	99·80	99·8
1908	2	Bunyip	17·40	24·96	100	100	17·93	26·22	103·0	104·5	19·27	25·86	110·8	105·8
1909	3	,, ...	33·68	27·87	100	100	33·80	28·75	100·4	103·2	34·80	28·84	103·3	103·5
1910	4	,, ...	24·68	27·07	100	100	24·43	27·66	99·0	102·1	25·78	28·07	104·5	104·6

(c) *Wheat after a Fodder Crop.*

Series and Blocks, B II to IV, F VII and VIII, and G VIII.

1907	1	Comeback . ..	33·74	33·74	106·2	106·2	31·75	31·75	100	100	32·86	32·86	103·5	103·5
1908	2	Bunyip	19·29	26·51	99·28	102·74	19·43	25·59	100	100	20·66	26·76	106·3	104·9
1909	3	,, ...	35·64	29·55	107·2	104·22	33·24	28·14	100	100	32·65	28·72	98·2	102·66
1910	4	,, ...	26·21	28·72	95·45	102·03	27·46	27·97	100	100	25·73	27·97	93·7	100·42

TABLE V.—AVERAGE YIELD OF 10 PLOTS UNDER DIFFERENT CONDITIONS OF GROWING WHEAT.

(a) *Crop stripped and straw afterwards burnt.*

Series and Blocks, B IV and V, F VIII and IX, and G IX.

Year.	No. of Years	Variety, &c.	Continuous Wheat. Yield				Wheat after Bare Fallow. Yield				Wheat after a Cover Crop. Yield			
			Per acre.		Percentage		Per acre		Percentage.		Per acre.		Percentage.	
			Computed Bus.	Average Bus	Yearly.	Average.	Computed Bus	Average Bus.	Yearly.	Average.	Computed Bus.	Average Bus	Yearly.	Average.
1907	1	Comeback and Bunyip* ..	23·08	23·08	100	100	32·53	32·53	141·25	141·25	33·74	33·74	146·5	146·5
1908	2	Bunyip . . .	20·18	21·60	100	100	17·40	24·96	86·22	113·73	19·29	26·51	95·59	121·04
1909	3	,, . ..	28·55	23·92	100	100	33·68	27·87	118·00	115·15	35·64	29·55	124·80	122·29
1910	4	,, .. .	19·36	22·78	100	100	24·68	27·07	127·48	118·24	26·21	28·72	135·38	125·57

(b) *Crop stripped and straw removed with reaper and binder.*

Series and Blocks, B II and VI, F X, and G VIII and X.

1907	1	Comeback and Bunyip* .	19·78	19·78	100	100	34·51	34·51	174·47	174·47	31·75	31·75	160·51	160·51
1908	2	Bunyip	20·64	20·21	100	100	17·93	26·22	86·87	130·67	19·43	25·59	94·13	127·32
1909	3	,, ...	23·42	21·28	100	100	33·80	28·75	144·30	135·21	33·24	28·14	141·96	132·2
1910	4	,, ...	13·25	19·27	100	100	24·43	27·66	184·38	147·50	27·46	27·97	207·25	150·96

(c) *Crop stripped and straw afterwards ploughed in.*

Series and Blocks, B III and VII, F VII and XI, and G XI.

Year.	No. of Years.	Variety, &c.	Continuous Wheat. Yield.				Wheat after Bare Fallow. Yield.				Wheat after a Cover Crop. Yield.			
			Per acre.		Percentage.		Per acre.		Percentage.		Per acre.		Percentage.	
			Computed Bus.	Average Bus	Yearly.	Average.	Computed Bus.	Average Bus.	Yearly.	Average.	Computed Bus.	Average Bus.	Yearly.	Average.
1907	1	Comeback and Bunyip* ..	20·2	20·26	100	100	32·45	32·45	160·17	160·17	32·86	32·86	162·2	162·2
1908	2	Bunyip	19·48	19·87	100	100	19·27	25·86	98·92	129·54	20·66	26·76	106·06	134·18
1909	3	,, ...	25·83	21·86	100	100	34·80	28·84	134·70	131·26	32·65	28·72	126·40	131·55
1910	4	,, ...	17·95	20·88	100	100	25·78	28·07	148·62	134·35	25·73	27·97	143·34	134·50

* In 1907 Bunyip was grown in Section 1, and Comeback in Sections 2 and 3.

TABLE VI.—FERTILISER TRIALS.

This table shows the percentage yields, both yearly and average, obtained from the use of various fertilisers. These percentages are based upon the assumption that the yields from check plots, which receive no manure=100.

Fertiliser.	Yearly Percentage.				Average percentage.
	1907.	1908.	1909.	1910.	
(a) Wheat every year.					
Sulphate of ammonia and superphosphate	123·3	120·9	122·96	165·36	133·13
Superphosphate	116·13	118·73	121·24	145·82	125·48
Sulphate of potash	98·0	99·27	109·18	107·7	108·54
Sulphate of ammonia	105·63	88·2	95·8	99·15	97·19
Sulphate of ammonia and sulphate of potash	117·7	90·93	106·4	117·79	108·2
Superphosphate and sulphate of potash	135·23	131·03	125·56	160·4	138·05
Sulphate of ammonia, superphosphate, and sulphate of potash..	133·0	128·77	132·68	163·69	140·78
(b) Wheat after Bare Fallow.					
Sulphate of ammonia and superphosphate	90·17	104·27	88·95	97·77	95·29
Superphosphate	92·67	101·97	89·31	106·9	97·71
Sulphate of potash..	98·1	94·3	100·99	100·21	98·4
Sulphate of ammonia	103·8	88·27	106·5	97·01	98·89
Sulphate of ammonia and sulphate of potash	101·17	88·07	110·21	97·25	99·17
Superphosphate and sulphate of potash	100·67	107·4	105·26	104·73	104·51
Sulphate of ammonia, superphosphate, and sulphate of potash..	93·63	99·77	94·75	107·08	98·81
(c) Wheat after a Fodder Crop.					
Sulphate of ammonia and superphosphate	101·47	117·5	104·09	100·03	105·77
Superphosphate	106·47	110·87	105·2	102·65	106·3
Sulphate of potash	108·23	106·7	104·69	103·71	104·58
Sulphate of ammonia	99·33	96·83	102·09	101·25	99·87
Sulphate of ammonia and sulphate of potash	99·	95·97	103·63	101·59	100·05
Superphosphate and sulphate of potash	101·77	102·37	104·97	108·17	104·32
Sulphate of ammonia, superphosphate, and sulphate of potash..	99·6	101·93	106·11	101·57	102·3

Rearing Calves

W. G. A. LEE, Dairy Instructor, Wagga Experiment Farm.

In order to secure strong, healthy calves, it is essential that the cow be well cared for previous to giving birth. She should be well fed during her milking period, and should have a rest of from six to eight weeks prior to calving. If the cow is milked too close up to the time of calving, the calf will be deprived of its full supply of nutriment, and the cow's milk-yield during the following lactation period will be greatly reduced.

Dry cows should not be turned into poor country, but should be kept in good working condition. If good pastures are not available, dry cows should be supplied with food of a laxative character, such as bran, lucerne, greenstuff, or silage. Cows about to calve should be kept in close, handy paddocks; and if much milk is made previous to calving, the udder should be eased, but not milked dry.

Allow the calf to remain with the cow for one day after birth, so that the cow may clean and feed the calf. The first milk drawn from the cow after the birth of the calf is known as "colostrum," and is of an abnormal kind, specially adapted for the nourishment of the young calf, and for cleaning the bowels of the waste matter of the materials used by nature in the construction and repair of the tissues. The young calf should be fed on its mother's milk for the first week, at the rate of 1 gallon per day, divided over three meals, and fed at a temperature of 90 to 100 degrees Fahr. After the first week, the mid-day meal can be dispensed with.

At the end of the second week, a small quantity of fresh skim milk may replace the whole milk. Gradually replace the whole milk with skim milk till the calf is four weeks old, when it should be fed solely on a skim milk ration at the rate of 1½ gallons per day.

At this stage a substitute should be added for the butter-fat taken from the milk.

Crushed linseed is one of the best and most economical substitutes for the extracted butter-fat. Linseed is more similar in composition to the solids of milk than any other food, and the oil which it contains is easily digested. It should be fed in the form of a jelly, prepared by boiling 1 part of linseed to 6 parts of water until a thick jelly is formed. Allow 1 pint of linseed jelly to each calf.

Cocoanut oilcake also gives good results. It is prepared by soaking or scalding, and fed in the same way as linseed.

The skim milk should be fed in a fresh, warm condition, and care should be taken to separate all froth from the milk before feeding, or poor results will follow. The addition of a little lime-water, about 1 per cent., is very beneficial.

Avoid over-feeding; feed regularly, and keep all feeding utensils scrupulously clean.

A good grass run, for calves only, with access to a good water supply and rock-salt, is very desirable. Protection from extremes of temperature should be provided.

After one month the calf should be allowed some solid food, such as lucerne, clover, or oaten hay; or dry grain food, as crushed maize or oats, linseed meal, and bran.

During dry weather, when green grass is not available, greenstuff or silage should be provided.

Heifers intended for dairy purposes should be kept in a healthy, growing condition from birth upwards; and, with this object in view, the foods selected should be such as go to the formation of frame and sinew, and not to the production of fat and surplus tissue.

Method of Feeding.—A set of small stalls or diminutive bails, in which each calf is fed separately by means of a calf-feeder, is an excellent method. By feeding calves in this way the milk is fed slowly and in a natural manner. The food is more thoroughly mixed with the saliva of the mouth, thus ensuring an easier digestion and a more complete assimilation than when a calf drinks from a pail or trough. Heifers reared in this way are very easy to handle and break in.

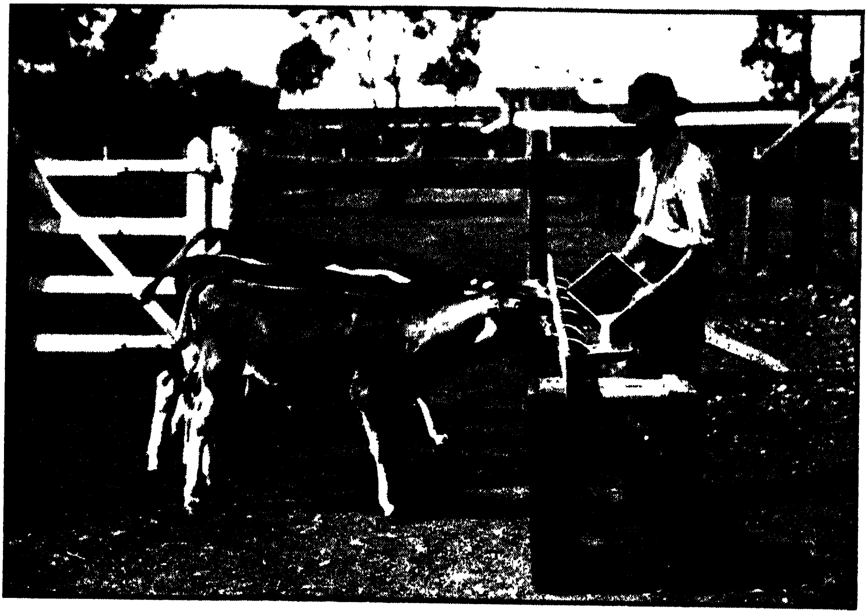
This method has been adopted on the Wagga Farm for thirteen years past, with most satisfactory results. The cost of the rubber teats is low—about £1 to rear fifty calves. Ordinary gas-piping, ¼ inch in diameter, is used to connect the teats with the buckets.

Weaning should take place gradually by reducing the milk allowance until the calf is weaned. When to wean depends on the growth of the calf and pasture available.

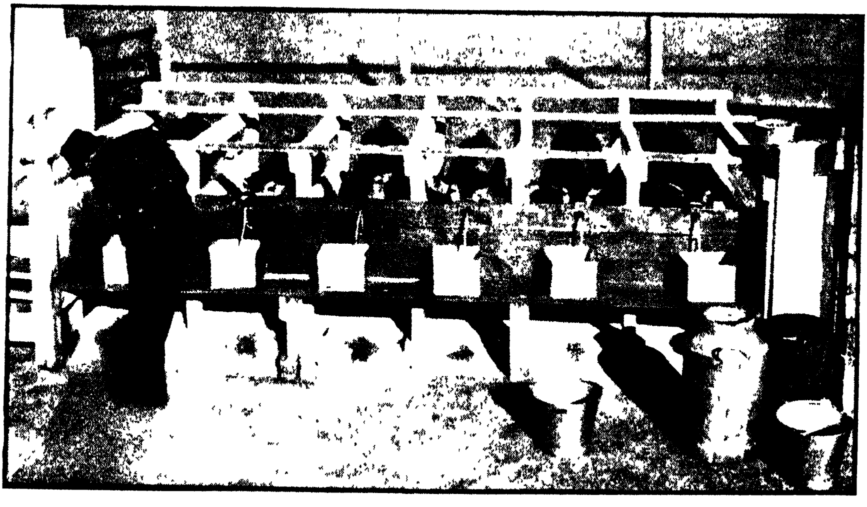
DRY FARMING IN WESTERN AUSTRALIA.

MR. GEO. L. SUTTON, late Wheat Experimentalist of this Department, now Commissioner for Wheat Districts in Western Australia, has forwarded to a friend here two photographs to illustrate the value of fallowing in dry districts. They show two plots at Minnievale, Western Australia. The crop on the unfallowed land is a foot or 15 inches high. That on the fallowed land is about 2 feet 6 inches high, and looks a very fair crop. The rainfall during growth was 549 points.

From the opening article in this issue, it will be seen that the rainfall during growth of wheat for hay at Nyngan Demonstration Farm in the same season was 532 points Fallowing was impossible, but still the crops gave a ton of hay per acre. The grain yields reached as high as 10 bushels, with 674 points rain. This shows the suitability of our western soils for wheat, provided the best methods are used. If the land had been fallowed, it is reasonable to assume that the results would have been much better.



The Morning Meal.



The Diminutive Bails.

REARING CALVES AT WAGGA EXPERIMENT FARM.

Judging Dairy Products by Points.

STUDENTS' SCORE CARDS.

M. A. O'CALLAGHAN.

NOWADAYS the tendency is to get judges of dairy produce, and of cattle also, to express their opinions in as definite a way as possible: and in no way, perhaps, can students be better made to concentrate their minds on any section, than by requesting that they shall give their estimate of the worth of that particular section in points.

For some years the judging of butter has been done on these lines, and since the introduction of the Commonwealth Commerce Act, factory managers, directors, and others have become quite familiar with the system of classifying butter by points. Frequently, however, buttermakers are met with who do not understand thoroughly the whys and wherefores of the graders' remarks, and hence the great advantage of training students at Agricultural Colleges, who will be farmers in the future, to understand thoroughly the system of judging dairy products by points.

At the request of the Principal of the Hawkesbury Agricultural College, I gave this matter my attention, and now publish, for the benefit of butter and cheesemakers generally, the scale of points drawn up, and the remarks in reference to same. Messrs. McMillan and Wallace have assisted me especially in the points relating to Cheddar cheese.

STUDENT'S SCORE CARD.

Milk.

Scale of Points.	Maximum Points	Student's Estimate	Instructor's Estimate
A.—Chemical Composition	40	....	......
Fat, 3·8 per cent.; solids, not fat, 8·7 per cent. Deduct one point for each ·1 per cent. below these standards.			
B.—Flavour	30	.. ...	......
A clean, pleasant, sweet taste, free from any bad abnormal odour, due to being badly kept, or being from cows in abnormal condition. An absence of sourness and a complete absence of putrefactive odours; also an absence of physical taints. Deduct points according to judgment.			

Milk—*continued.*

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate.
C.—Condition ... ... Where possible a bacteriological examination should be made, and should show an absence of pathogenic and putrefactive germs. Milk must be free, as far as the eye can ascertain, from foreign matter; and this may be tested by straining a small portion through a very fine cloth. Flies and decaying organic matter are points for which the student should make a severe deduction.	30	......	......
Total	100	......	......

General Remarks ______

Student's name ______ Date ______

Student's Score Card.

Cream for Buttermaking.

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate.
A.—Flavour ... ... If fresh, to be sweet, nutty, and of a clean after taste. No smell of any pronounced type must be present, and there must be an entire absence of any animal odour or putrefactive decompositions. If cream is advanced in ripeness or fit for churning there must be a clean lactic acid taste, and there must be no greasy or sticky after taste left on the palate. A pleasant tasting sourness is what is required.	60	......	......
B.—Composition, Consistency, and Texture ... Not less than 35 per cent. and not more than 50 per cent. butter fat. In cold weather the lower figure is advisable, to encourage a good lactic fermentation; while during warm weather, and with home separation, a cream of about 48 per cent. butter fat is advisable, so that fermentation may not be too advanced when the cream reaches the butter factory. The cream should be smooth and regular in consistency, and the texture should be smooth, showing no evidence of coagulated particles of casein. Too thin a cream should be penalised.	25	......	......

Cream for Buttermaking—*continued.*

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate.
C.—Condition and Acidity ... ... The cream should be clean, and the vessel containing it should present a clean appearance inside and out. When the lid is removed from the can, there should be no offensive odour, and when the cream is stirred the odour should also be a pleasant one. Flies and pieces of foreign matter are frequently met with, and the cream should be heavily penalised for such evidences of carelessness. The degree of acidity should depend to some extent on the season of the year, and on the composition of the cream. A cream very rich in butter fat will be ripe for churning with a lower acidity than a cream containing less butter fat. Australian conditions are such that a cream of about 40 per cent. butter fat is generally demanded, and, therefore, the acidity should not be more than ·6 per cent.; and even ·5 per cent. is better for export purposes in very thick creams.	15	......	......
Total	100	......	.....

Remarks ____

____

____

Student's name ______________________ Date __________

STUDENT'S SCORE CARD.

Fresh Cream for Table Use.

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate
A.—Composition ... ... 50 per cent. fat. If it falls below, deduct ½ point for each 1 per cent.	30	.. ...	......
B.—Flavour and Keeping Quality ... ... Acidity not more than ·15 per cent. The flavour must be sweet and nutty, and the taste and smell should be free from anything foreign to freshly produced cream from healthy grass-fed cattle. The temperature should not exceed 60 degrees Fahrenheit.	60	.. ...	......

Fresh Cream for Table Use—*continued.*

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate.
C.—Condition ... ... Absence of any curdy particles or evident gas. When run off a spoon the cream must show a smooth consistency, and be of velvety appearance. No dust or foreign matter should be evident.	10	......	......
Total	100	......	......

Remarks

Student's name __________ Date ______

STUDENT'S SCORE CARD.

Butter.

Scale of Points	Maximum Points	Student's Estimate.	Instructor's Estimate.
A.—Flavour, including Aroma and Taste ... Freshly made butter from good, well ripened cream, should have a nutty, sweet aroma, and pleasant, nutty taste. This fine flavour is very volatile, and disappears after a day or two. Ordinary butter should have a clean, pleasant smell and taste, with a complete absence of anything unpleasant in the after taste. Putrefactive odours and tastes are bad, and a student should be severe thereon, while physical taints, due to food, do not get worse, and may be treated more leniently.	50	......	......
B.—Texture, including Body, Grain, and Moisture. Texture should be firm, should break showing the granular condition, and also exhibit an absence of excessive free moisture. A greasy sticky texture (due to excessive friction or to high temperature) is worst, and the presence of buttermilk as exhibited in the moisture should be severely dealt with when judging keeping butters. There should be a complete absence of air-holes.	30	......	......
C.—Colour... ... . A light straw colour, with an absence of any cloudy or muddy appearance, is preferred, but unsalted butter may be much lighter in colour without defect. If mottles or streaks are present, the student should be severe in his marking.	5	......	......

Butter—*continued.*

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate.
D.—Salting ... ... From 2 to 2½ per cent. of salt is quite sufficient in finished butter, and if there is an excess of salt, or if streaks are present which are due to the salt being badly incorporated, points should be deducted.	5	......	......
E.—Finish, Packing, and Package ... ... The finish should present a clean, tidy appearance, and there should not be the slightest indication of the butter having been made greasy by too much friction in finishing the surface. The honeycomb appearance presented by a suitable roller is most appropriate. Butter showing pale and tallowy on the surface should be penalised in the way of marks, as this is due to too much friction in bringing about the finish. Butter put up in boxes should be so packed that there will be no air-holes in the contents; nor should there be any unnecessary spaces in the corners at the bottom or top. Butter put up in boxes should be wrapped in parchment paper, and care should be taken to see that there is a separate square to cover the top, apart from the portion which folds over and finishes like an envelope. If the parchment paper is defective, points should be deducted. The boxes should be made of wood free from taint or smell, and should be well made, and in clean condition.	10	......	......
Total	100	......	.....

Remarks

Student's Name Date

STUDENT'S SCORE CARD.

Cheddar Cheese.

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate.
A.—Flavour ... ... Nutty, pleasant smell and taste, free from bad odour, and not sharp, but pleasant to the palate. (Ripened cheese must dissolve freely in the mouth.) Deduct points for any foreign smell or taste, but be most severe on any offensive putrefactive smell or taste.	50	......	.....

Cheddar Cheese—*continued.*

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate.
B.—Texture and Body ... ... The core should have a silky touch, and be mellow in body. The core, or plug of cheese, should appear perfectly solid, showing no holes; should be resistant when pressed in the hand, and should break like a piece of flint or very hard stone. Body should not be gritty, mealy, or soft.	30	......	......
C.—Colour ... ... Should be clearly defined. A plug when held between eye and light should be semi-transparent and regular, showing no streaks or white specks. The blanched colour due to high acidity and bleaching should be severely penalised by the student.	15	......	... ..
D.—Finish ... ... Cheese should be of good shape, bulging but little on sides, with a slight rise on ends of cheese. Cloths should be well pressed in, tree from wrinkles, and not rough on ends. Rind should be free from cracks and discolouration, and have a clean appearance.	5	... ..	......
Total	100	......	......

Remarks

Student's Name Date

Seeds from the East.

In October, 1910, *Gazette,* page 881, reference was made to a number of varieties of Chinese and Japanese vegetables, of which Mr. J. B. Suttor, Commercial Commissioner in the East, had obtained seeds for trial. Reports have now been received from the Hawkesbury Agricultural College respecting potatoes, carrots, climbing cucumbers, radishes, egg plants, runner beans, cabbages, turnips, kale, and spinach. The potatoes are being grown in quarantine, and are now in their second season.

All of these vegetables are varieties which have little or no value here. This was only to be expected, as for many years past seedsmen have been searching throughout all parts of the world for new varieties of vegetables, and have made a pretty thorough investigation of Japanese and Chinese varieties. Should any of the seeds tried at the College and Farms appear to possess any merit here, the information will be published in the *Gazette.*

Maize.

[Continued from Vol. XXII, page 1046.]

A. H. E. McDONALD,
Inspector of Agriculture, North-West District.

The Soil.

MAIZE is one of the most adaptive farm crops, and is rivalled, perhaps, only by wheat. Provided moisture is assured, satisfactory yields of grain of good quality can be obtained from most classes of soil. The vigorous growth which is often made on what can only be classed as inferior soils, by a crop which draws so heavily upon the fertilising elements, is at first sight somewhat astonishing. It is calculated by the United States Department of Agriculture that a crop of 50 bushels of shelled corn, with the stalks, takes away from the land 80 lb. of nitrogen, 29 lb. of phosphoric acid, and 55 lb. of potash. These quantities are much in excess of those which are taken away by a heavy crop of wheat, oats, or barley.

But whilst corn is successfully grown on many classes of soil, the influence of fertility is at the same time clearly manifested in the yields. This is only natural when the amount of fertilising ingredients required by the crop is considered.

The most vigorous growth and the heaviest returns are obtained on deep, free, alluvial soils, and deep, rich, black land, formed as the result of the decay of volcanic rocks. Maize grown on this class of land attains an enormous height, and is distinguished by its healthy dark green appearance. Yields ranging up to 100 bushels per acre are by no means uncommon on soil of this nature. The farmer who can obtain rich land on reasonable terms is in a fortunate position, as the cost of producing the crop is practically the same as on poorer land, while the returns are so much greater.

The cost of growing the crop, however, is not the only item to be reckoned in the economics of corn production. The interest on the capital, as represented by the land, has to be considered; and since these fertile soils are higher-priced than poorer soil, the advantage of their fertility is to some extent offset by this. On the poorer soil the yield is not so high, but where the land can be obtained at a price commensurate with its fertility, maize-growing is often quite profitable. From the poorer soils the number of bushels obtained per acre is not so great, but still it is found that such soil yields a profit when sown with maize after the working expenses are deducted from the gross return.

The main requirements in a maize soil are depth, friability, good drainage, and capacity for retaining moisture for a considerable time. Broadly speaking, given these, a profitable yield is assured. These physical conditions of the soil are of vastly more importance than the chemical condition, despite the fact that such large quantities of the chemical substances are withdrawn by a single crop. Deficient fertility, due to lack of the essential chemical substances, can be remedied comparatively easily and cheaply by an approved system of fertilising, but deficiencies in the physical condition are often difficult and expensive to correct. For instance, in different parts of this State vast tracts of soil are found which, although rich in plant-food ingredients, are of little or no value for crop production, owing to their intractable physical condition.

Whilst it may be confidently asserted that good physical conditions are of the first importance, still a chemical analysis of the soil is useful. Although it may not indicate whether high crops are to be expected, or what manures are required, it is valuable in making an estimate of the permanent fertility of the soil. This is of considerable importance, as many virgin soils, which are apparently suitable, may be quickly exhausted, and require heavy dressings of fertilisers Since soils naturally well supplied with those substances which serve as plant-food, may, by a rational system of cropping, be maintained in good condition for many years without recourse to heavy expenditure in the purchase of manures, an examination to determine this point is of vital importance.

As an instance of this, some of the granitic soils of the Tenterfield district may be mentioned. For a time after they are brought under cultivation, these soils return profitable crops without resort to fertilisers, but after a few crops are taken off it is found that they are unable to supply the needs of maize, and manures have to be applied. These soils whilst new contain a fair amount of available plant-food, but it is soon exhausted, and good yields during the first few years of cropping are by no means a warrant for supposing that the soil will permanently give good crops.

As a rule, soils which are in good physical condition contain a fair amount of the substances which go to form plant-food in a form in which they readily become available for the crop's requirements. On the other hand, soils which contain large quantities of these substances may be barren through their lack of good physical condition. In such soils the plant-food may not be in the right form to be absorbed by plants, and the unfavourable physical conditions prevent it being converted into such a form. It must be soluble before it can pass into the plant sap and become a nutrient, and it becomes soluble only through chemical and biological agencies in the soil. These agencies, however, are inactive when the physical condition of the soil is bad, and, therefore, the plant-food remains unavailable and, consequently, useless. Warmth, air, and moisture are essential, and the process of change cannot take place when any one is absent. Just as no change will take place in hay from which all moisture has been evaporated, in silage from which the air is excluded, or in fruit placed in cold storage to exclude the warmth, so no change will take place in the soil under the same conditions. Since very few soils are altogether devoid of plant-food, good results may therefore be expected if the conditions are favourable to its conversion into a usable form.

Warmth has a great influence in promoting chemical and biological changes in these substances; and it is probably because maize grows during the summer, when the ground is warm, that it can be grown successfully on soils which are rather too poor for crops which grow in the cold season. In the cold weather the plant-food does not become available, and the crop suffers in consequence; but during the warm summer months the change is rapid, and maize reaps the benefit. The practice of sowing the crop in rows, so that cultivation may be given to keep the land loose and moist, further encourages nitrification and the other processes which bring insoluble soil substances into a suitable condition for absorption.

Apart from their importance in encouraging the formation of available plant-food, warmth, moisture, and air are absolutely necessary to the maize itself, and anything which prevents the best conditions obtaining in this respect reduces fertility. The black-soil plains are phenomenally rich in plant-food, but, owing to the unfavourable physical condition of the soil, they cannot be cultivated.

It is scarcely necessary to refer here to the part which warmth plays in the physiological development of the plant. It is enough to state that maize, in common with most other plants, cannot thrive in a cold soil.

Good aeration is required, because, although plants breathe in through their leaves, the chief gas which they absorb in this way is carbon dioxide; the oxygen and hydrogen which they require is absorbed chiefly through the roots.

The effect, if not the functions, of moisture is too well understood to require mention. The disastrous results of a drought emphasize its importance, and indicate the value of land which has the power of retaining moisture to a large degree. We may state, however, that in addition to supplying the tissues of the plant, to which it is as necessary as in the case of animals, the moisture acts as the carrier of plant-food from the soil to the roots and then through the body of the plant. As sap, it carries the food substances to the leaves, where they are changed into starch, sugar, oils, &c., and then redistributes them to the different parts of the plant. Therefore, if the supply of moisture is insufficient, no movement of the nourishing elements can take place.

On the other hand, if the soil contains more than the normal amount of moisture, the solution of the salts of the earth, which nourish the plant, becomes too diluted, and to obtain its nourishment the plant has to absorb and transpire an enormously increased amount of liquid. This divergence from the normal conditions has a detrimental effect upon the general health of the plant. We can see, therefore, the necessity of having a well drained soil. A waterlogged soil is poorly aerated, because all air is forced out by the water; it is cold, because the heat of the sun's rays is absorbed by the water; and, as just mentioned, the solution of plant-food is weakened. The total effect of bad drainage is that development is retarded; the stalks become spindly; the leaves lose their dark green colour and turn yellowish; and the cobs are reduced in size, while the grain does not set well.

It is erroneous to suppose that in a comparatively dry climate, such as ours, the soil is not likely to be waterlogged. If the rains were evenly distributed, possibly the soil would not become too wet at any time; but since it occurs periodically in heavy falls, it frequently happens that the crop suffers through excessive moisture. Land which is naturally well drained should be selected, but where it is not so, steps should be taken to remove the excess of moisture. Bad drainage is usually due to an impervious subsoil a few inches below the surface, and generally it is found that the land is wet in patches. For instance, a more or less circular patch of wet land may be found in what is otherwise naturally well-drained land. This is generally due to a depression in the clay subsoil, which may or may not be indicated by a depression in the surface soil. As a rule, it can be easily remedied by cutting a drain through to a lower place.

Although excessive soil moisture has to be guarded against occasionally, the maintenance of a sufficient supply has always to be ensured. The yield of maize is lowered, and limitations placed upon extension of its growth to an immeasurably greater degree by lack of moisture than by excess. In even the best districts the yields would be largely increased could moisture be supplied to the crop regularly, while in other districts the incapacity of the soil to retain moisture prevents profitable maize production. Whilst much may be done by cultivation, the first essential is, that the soil be naturally well fitted to retain moisture. Soils vary considerably in this respect, and it is their efficiency viewed from this standpoint which determines whether maize can be grown in certain districts. The rainfall is not everything, although first importance is usually attached to it. In those districts where the rainfall is doubtful, very careful examination of the soil should be made.

Soil is made up principally of sand, clay, and partially decomposed organic material called "humus"; and it is the proportions of these which determine the amount of moisture which can be held in store for the use of the plant. Of these the most importance must be attached to the humus, which has a really wonderful capacity for absorbing and retaining moisture. A soil which contains a good deal of it is friable, kindly to work, and remains moist for a considerable length of time after rain. It is noticeable that such soil can be worked comparatively easily, whether dry or wet. When, however, the humus is destroyed, or when it is naturally deficient, the soil has an entirely different nature. If it contains a large quantity of clay, it is dense and difficult to work, while if sand is the predominating ingredient it is loose and open. In either case it dries out quickly after rain.

A deep soil is preferable for maize, partly because maize is a deep rooter, and such a soil provides an extensive range; and partly because the deeper the soil the greater capacity it has as a reservoir for water.

In selecting a soil for maize then, attention should be paid to its depth, to its friability, and to its capacity for holding moisture. It should not be so dense that it is difficult or impossible to dig with a spade when dry, and it should not be impervious to water; but neither should it be too granular nor too sandy. In short, a deep free loam is the most satisfactory soil.

Alluvial soils of the coastal rivers, with the characteristics mentioned above, are famous for their maize yields. In the Inverell district, many fine harvests are obtained on the rich black and red soils of basaltic origin. On the other hand, in the Tenterfield district, maize is grown extensively on soil derived from granite which is by no means rich; and although the maximum yields are never as large as they are in warm, moist climates with a rich soil, they are dependable and profitable.

These observations indicate in what diverse soils maize may be grown. The accompanying table of analyses shows the differences which exist between some typical maize soils. The Inverell black soil and the Hunter River alluvial soils are famous for their fertility, and it is not at all astonishing that maize thrives in them; but that such fertility is not absolutely necessary is indicated by the analysis of the Tenterfield soils, which, although they contain very much less of the substances which act as plant-food, give very profitable yields. Despite the very wide difference in the fertility, maize in all these districts is a main crop, and around Tenterfield considerably more land is sown to it than to any other crop. It would seem that where the mechanical condition is suitable, maize can be grown successfully, provided right cultural methods are practised.

CHEMICAL ANALYSES OF TYPICAL MAIZE SOILS IN NEW SOUTH WALES.

District.	Moisture.	Volatile	Nitrogen	Lime.	Potash.	Phosphoric Acid
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Inverell soils[*] . . .	7·51	10·33	·111	·460	·152	·428
Hunter River alluvial soils (average of 11)[†].	5·98	8·45	·120	·656	·184	·214
Tenterfield blue granite soils—light loam, 12 inches and over in depth, with loam subsoil[†].	1·61	5·39	·098	·168	·230	·050

[*] Analysis made by Mr. F. B. Guthrie.

[†] Analyses made by Dr. H. I. Jensen.

Trials of Varieties of Kale.

In March, 1910, Mr. H. W. Potts, Principal of the Hawkesbury Agricultural College, asked the Department to obtain from New Zealand some seed of a "marrow cabbage," a French cattle fodder-plant, which was reported to be giving excellent results in official tests in the Dominion. The New Zealand Department of Agriculture kindly supplied a packet of the seed, and informed us that it was Chou Moellier, a plant which has already been tested and reported upon in the *Gazette* (Vol. XXI, pp. 533 and 793). Samples of the New Zealand seed were distributed to the Hawkesbury Agricultural College and Experiment Farms.

At the same time, the Agent General in London was asked to obtain from Messrs. Vilmorin-Andrieux & Co., seedsmen, Paris, samples of several varieties of Borecole or Kale seeds, and packets of the following were received in July, 1910:—Tall Red Borecole; Thousand-headed Kale; Collard's Georgia Borecole; White Chou Moellier; Red Chou Moellier; and Jersey Tree Kale. Small samples of these seeds were also sent to the College and Farms for trial.

The following is a summary of the reports received to date:—

Hawkesbury Agricultural College.

Chou Moellier (Marrow Kale), from Department of Agriculture, New Zealand.—Received 7th May, 1910; planted in seed-bed, and in the middle of November transplanted into rows 3 feet apart, the plants being placed every 2 feet in the rows.

The crop grew strongly and evenly from the start, and by the middle of March was 4 feet in height. Three months later, when from 5 to 6 feet in height, the crop was harvested, yielding at the rate of 22 tons 19¾ cwt. per acre.

It should be noted, however, that these figures comprised, in addition to the stems, only the leaf growth from the upper 2 feet of stem, the lower foliage having decayed during the period of growth, due in some measure to the attacks of aphis. The vitality of the plants, however, was not affected by these attacks, although in an adjoining bed a plot of Ragged Jack kale was completely killed off.

This year's crop was chaffed and fed to poultry, the stock showing a great liking for the leaf of the plant. Previous tests with Chou Moellier have shown the foliage to be relished by all classes of stock, while the stems are eaten by pigs only.

An area is to be established for the purpose of supplying green fodder to the poultry department.

Further information with regard to Chou Moellier at the College is supplied in an article by Mr. A. J. Pinn in Vol. XXI, page 793, *Agricultural Gazette.*—A. V. DONNAN, Eperimentalist.

BATHURST EXPERIMENT FARM.

Borecole.—Two plantings were made, one each in November and January last. The plants ran to seed before making much growth, and did not give satisfactory results.

Chinese Kale.—A planting was made on 11th January, and it also ran to seed too soon.

Chou Moellier.—This was planted out on 11th January last, and made satisfactory growth.—R. W. PEACOCK, Manager.

YANCO EXPERIMENT FARM.

Borecole and Chou Moellier (French seed).—These were sown in seed boxes on 11th February, 1911, and transplanted 18 inches apart in rows 3 feet apart, in the irrigated vegetable garden. The plants made good growth. Their foliage was much relished by cows and poultry, but the stalks were not eaten. The amount of labour required to produce is an important factor against their being considered as a cattle food.

Results of Trial.

Variety.	Average weight of plants.	Average height of plants.	Proportion of weight which would not be eaten by cattle
	lb.	ft. in.	per cent.
Tall Red Borecole	10	3 6	28
Collard's Georgia Borecole	12	4 0	28
White Chou Moellier . .	8	4 6	62
Red Chou Moellier	7½	4 0	62

Kales.—These were sown in the field on 12th April, 1911. A report as to their suitability to local conditions will be forwarded later.—F. G. CHOMLEY, Manager.

GLEN INNES EXPERIMENT FARM.

A small plot of each variety was planted, consisting of two rows 4 links apart and 1 chain long. All plots were planted on 28th July, 1910. Germination was very good in every plot, but shortly after germination dry weather ensued for about six weeks, which checked the growth considerably. Good rains then followed, and the plots made very fair growth.

Some seed (2 lb.) of Chinese Kale was saved, as this variety ran to seed early, and there being no other variety in flower there was no chance of its becoming crossed.

Varieties arranged in order of merit.

White Chou Moellier.—This variety showed itself to be far superior to any other variety tried. The growth is most rapid; it is tallest, and carries the greatest quantity of leaf. The stem is not woody, and practically the whole of the plant is edible. One row of plants was stripped of leaves, only leaving the crown untouched, so as to resemble "feeding-off." The growth following was very rapid, and within four weeks of stripping there was no noticeable difference between the stripped and unstripped rows. Height of plants, 4 feet 6 inches.

Several farmers have remarked upon the large amount of greenstuff, and they intend giving this variety a trial.

Thousand-headed Kale.—Growth similar to White Chou Moellier, but the quantity of leaf is slightly less.

Jersey Tree Kale.—Growth fairly good, and is worth further trial.

The purple-tinted varieties (*Red Chou Moellier* and *Tall Red Borecole*) have not done so well, and are inferior in growth to the above-mentioned varieties.

Chinese Kale ran to seed early, probably on account of the seed not being acclimatised.—H. BARTLETT, Experimentalist.

LUCERNE AT TOORAWEENAH.

MR. R. D. CRUICKSHANK, Junior, "The Glen," Tooraweenah (*via* Gilgandra), writes:—

I planted a small patch of lucerne in my garden last September twelve months, just to give it a trial. I was very much surprised at the result, as I am sure water could not be reached under 50 feet, if any at all. The following dates of sowing and cutting may prove interesting:—

Sown—18th September, 1910, in very hot, dry weather.

Cutting.	Date.	Height of Growth.
First	10th December, 1910	15 inches.
Second	7th January, 1911	3 feet.
Third	12th February, 1911	2 feet 6 inches.
Fourth	21st March, 1911	2 feet.
Fifth	13th October, 1911	2 feet.

I have cut it once since the last date, and it is now (23rd November) ready to cut again.

My opinion is that this is going to be a great lucerne district in the near future. I planted 7 acres at the end of July and early in August this year, and sold fat bullocks to the butcher to-day off same. The season has been very dry since planting.

If this should meet the eye of any man farming in a district which is considered too dry for lucerne, the Department will be glad if he will kindly ignore public opinion and give the plant a thorough trial. The pages of this *Gazette* are always open for publication of the results.

Common Errors in Measuring Drenches and Drenching.

MAX HENRY, M.R.C.V.S., Government Veterinary Surgeon.

During work amongst sheep one hears frequent complaints from stock-owners that, although they follow the Departmental directions explicitly in preparing and administering drenches, yet serious losses, considerably more than should occur, are not uncommon. As no drench which has not been put to practical test, or is known as a commonly used one in veterinary practice, is ever recommended, one is at a loss to understand this. Generally one is inclined to attribute it to such causes as unintentional overdosing, dosing too hurriedly and so causing choking, to undissolved particles of arsenic being given in the drench, and so on.

Some recent cases reported, however, suggest what would lead to very grave errors in the quantity of the drug being administered if it occurred. It is nothing less than a very natural confusion taking place, on account of the varied and divergent weights and measures which are in common use.

In one instance it was recommended by the Department that so many grains of arsenic should go to the pint of water. In mixing it, however, the stock-owner used a publican's pint, which holds only 13 ounces, whereas the measure invariably used in dealing with medicines and drugs is the Imperial pint of 20 ounces. It can readily be understood that, as a consequence, a far greater dose than was intended was being administered.

Instances might also be quoted resulting from the confusion of apothecaries', troy, and avoirdupois measures. It is therefore thought that it might be of assistance to stock-owners if a short note were published showing the weights and measures used in dealing with drugs, and their relationship to other measures.

In measuring powders and solids the following—the apothecaries'—is the table used for drugs:—

60 grains .. ... = 1 dram
8 drams ... . .. = 1 ounce
12 ounces ... .. . = 1 pound

It will thus be seen that 1 oz. equals 480 grains. In troy weight the ounce also equals 480 grains, but in avoirdupois it only equals 437½ grains.

For liquids, the measure used is as follows:—

60 minims (drops) ... . = 1 dram
8 drams ... ... = 1 ounce
20 ounces ... . = 1 pint
8 pints ... . = 1 gallon

The publican's pint, as already mentioned, contains only 13 oz.

In country districts it frequently occurs that no measuring-glass is available, and one is forced to use domestic appliances for getting an approximate measure. Roughly, the following are the equivalents for these. They apply only to watery liquids, as of course solids vary so greatly in weight that they can hardly be estimated in this way:—

1 tea-spoonful... ... ... = about 1 to 2 drams
1 dessert-spoonful ... ... = ,, 3 to 4 ,,
1 table-spoonful ... ... = ,, ½ to 1 ounce
1 egg-cupful ... ... = ,, 1¼ to 1½ ounces
1 cupful (small) ... = ,, 5 to 7 ounces
1 ,, (large) ... ... = ,, 8 to 11 ,,
1 tumblerful (average) ... = ,, ½ pint (Imperial)

The above quantities were all obtained by the actual measurement of different spoons, cups, &c., or are taken from what are known as standard capacities for the various utensils; and it will be seen how hopelessly impossible it is to measure any liquid accurately in this way. Any man who is dealing at all with poisonous drugs, such as arsenic, turpentine, opium, &c., should certainly obtain some properly graduated measure—preferably of glass—with which to reckon his doses and quantities.

The problem of mixing antiseptic washes—say for use in contagious abortion—is also often a matter of difficulty. The following measurements may be of use:—

½ per cent. = 1 fluid ounce in 10 pints (Imperial) or 1¼ gallons
1 ,, = 1 ,, ,, 5 ,, ,, 2½ quarts
5 ,, = 1 ,, ,, 1 ,, ,,
10 ,, = 2 ,, ,, 1 ,, ,,

Again, it often occurs that the stock-owner is told to make percentage solutions of solids in a liquid. This is a more difficult matter, but the following may be taken as a guide:—

To make a 1 per cent. solution of a solid in a liquid, take 4½ grains of the solid to 1 ounce of liquid.

To make a 2 per cent. solution, take 9 grains to the ounce.
,, 5 ,, ,, 20 ,,
,, 10 ,, ,, 40 ,,

These are only approximate, but are close enough for all practical purposes.

The whole trouble could be obviated if, as a nation, we had only the common sense to adopt the metric system instead of the extraordinary hotch-potch of weights and measures at present in use.

With regard to administering drenches, errors are frequently noted which are followed by bad results, and then the drench and the Department are blamed. In connection with horses, the most common error is that of giving a drench by the nostril. The nose is intended for breathing, and not for the administration of liquids, for which the mouth is provided; and in giving a drench by the nostril one always runs a most unnecessary risk of some portion of the fluid getting into the windpipe, and either immediately choking the animal or later on causing pneumonia. With the majority of horses it is just as easy, and far less risky, to give a drench by the mouth than it is to give it by the nostril.

Again, the horse is too often interfered with when holding a mouthful of liquid by having his throat pinched. This not infrequently makes him cough, and allows the fluid to get into his windpipe.

Drenching is always a matter requiring more or less patience—according to the horse's character—and he cannot be safely hurried with a drench. Take time, and if the horse attempts to cough lower his head at once. It is better to waste a portion of the drench than to kill your horse.

In drenching sheep the head is sometimes forced too far back, and the natural manner of swallowing interfered with; and here again, especially with lambs, the matter is hurried over too much. It is not unnatural to hurry over the matter of drenching, as it is not a pleasant job. If the main idea is to benefit the animal, a little care may reasonably be given to it.

EXPERIMENT IN COLD STORAGE OF APPLES TO CHECK BLACK SPOT.

AT the suggestion of Dr. F. Tidswell, Director of the Bureau of Microbiology, the Department of Agriculture purchased thirty-six cases of apples, twelve from each of three growers in different districts, and placed twelve cases in each of three city cold stores in April, 1911. Each dozen cases comprised four cases apparently free from black spot; four cases slightly affected with the disease; and four cases of mixed clean and slightly infected fruit. The object of the experiment was to ascertain whether holding the fruit in cold storage at 35 degrees Fahr. would prevent the fungus from growing. The varieties were Granny Smith, Jonathan, Five Crown, Ben Davis, Sturmer, Late Irish Peach, and Munroe's Favourite.

On 16th September, after the fruit had been in cold store for five months, an officer of the Department examined the cases, and could not detect any spread of the fungus, all the fruit appearing to be in the same condition as when placed in the store. The fruit was then, with the exception of six cases, placed in the hands of Messrs. J. and G. Roughley for sale; but the consignment turned out very unsatisfactorily. The agents report that all the apples were more or less affected with black spot, the Jonathans and Sturmers being especially bad in this respect. Some of the Granny Smiths were black, soft, and pulpy, caused apparently through being stored in too low a degree of temperature. The prices received ranged from 3s. to 6s. per case.

The remaining six cases were examined on 30th October. No further development of black spot was noticeable, but the fruit was showing signs of scald, and was going off. The cases were, therefore, delivered to Messrs. Roughley for sale. Half of them brought 10s. per case; but the others were completely frozen, and only realised 4s. per case.

On 3rd October, a case of the stored apples affected with black spot was sent to the Bureau of Microbiology. Seven affected apples were placed under glass bell jars for observation, the spots being outlined in Indian ink. On 10th November the apples were examined, and in no case had the number or extent of the spots increased. The apples had passed from a green to a deep yellow colour, and the area around the spots had become slightly sunken, and darker than the surrounding tissue. Four of the apples decayed somewhat from the attack of another fungus.

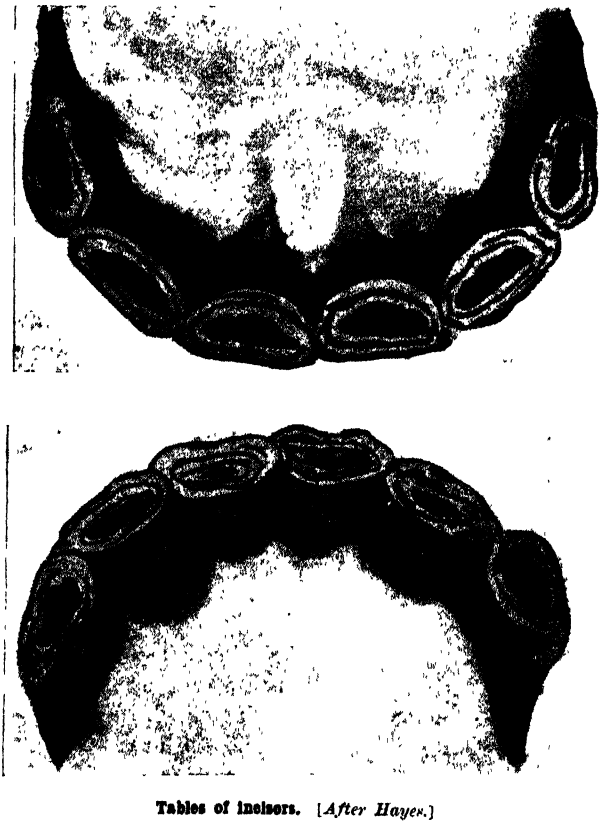
The Teeth of the Horse and its Age.

Compiled by the Veterinary Officers of the Stock Branch, under the authority of
S. T. D. SYMONS, M.R.C.V.S., Chief Veterinary Officer.

The Teeth.

THOUGH it is quite common to meet men who profess to be able to tell accurately the age of horses up to a late period in life, nevertheless it is safest for any person ordinarily not to claim to be able to read a horse's age with accuracy after the animal has passed 8 years or so.

It is not proposed to deal here with the construction and formation of the teeth, these being matters of more interest to the anatomist and physiologist than to the average horseman; but to deal briefly with the general arrangement of the teeth and the ages at which they appear, and, in the case of the milk teeth, are shed and replaced by others.



Tables of Incisors. [*After Hayes.*]

The horse has 24 temporary teeth, often known as the milk teeth, and these are shed in order to make room for the corresponding permanent teeth. They consist of 12 incisors, 6 in the upper, and 6 in the lower jaw, and 12 molars, also 6 in the upper, and 6 in the lower jaw. The number of milk teeth is the same in both sexes: and it must be remembered that all permanent teeth are not preceded by milk teeth.

The permanent teeth of the male horse are 40 in number, viz., 12 incisors, 4 tushes, and 24 molars. In the female the permanent teeth generally number 36, the tushes being absent, as a general rule; but mares with tushes are occasionally found.

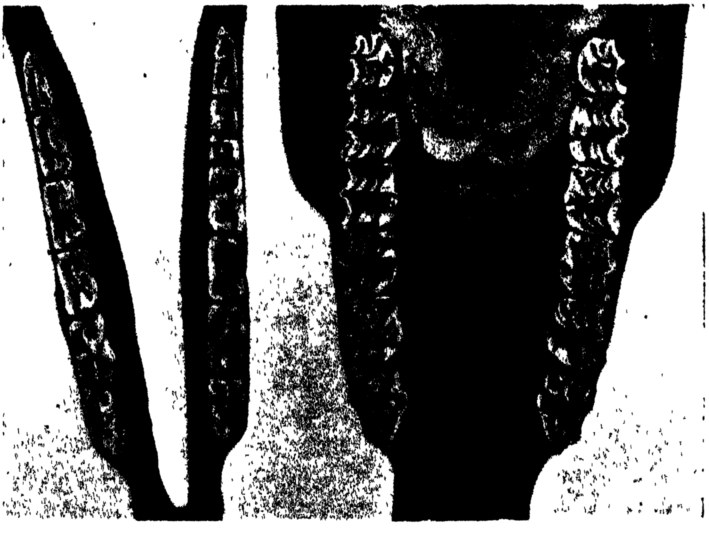
The arrangement of temporary and permanent incisors and molars in each jaw is as follows:—

The *incisors,* 6 in number in each jaw, occupy the front of the jaw, and form a semicircle with the convex face looking forward.

The *molars,* 12 in number in each jaw, are placed at the back of each side of the jaws, 6 on each side of the upper jaw, making 12 in all, and a similar number on each side of the lower jaw, thus completing the 24 molars.

Between the incisors and molars, there is a space in which the *tushes* are found.

The "marks" in the permanent teeth, by means of which the age from 5 to 8 years is told, are depressions of an irregular oval shape found on the the upper surfaces of the incisor teeth. These depressions are dark in colour, and there is one to each incisor tooth.



Mouth at five years, showing tables of back teeth (⅓ natural size). [*After Hayes*]

For purposes of comparison, the following formulæ of the teeth may be of interest:—

Temporary teeth, both sexes.

	Molars.	Incisors.	Molars.	
Upper jaw ...	3	6	3	= 24
Lower jaw ...	3	6	3	

Permanent teeth, male.

	Molars.	Tushes.	Incisors.	Tushes.	Molars.	
Upper jaw ...	6	1	6	1	6	= 40
Lower jaw ...	6	1	6	1	6	

Permanent teeth, female.

	Molars.	Incisors.	Molars.	
Upper jaw ...	6	6	6	= 36
Lower jaw ...	6	6	6	

The permanent teeth which are not preceded by milk teeth are the 4 tushes, and the 4th, 5th, and 6th molars in each jaw.

The molars are numbered from 1 to 6 in each jaw, and on each side of it; the incisors are distinguished by a special name for each pair in upper and lower jaw alike. The central pair of incisors are known as the *centrals*; the teeth on each side of the centrals are known as the *laterals*; and the teeth on each side of the laterals as the *corners*. The arrangement is thus:—

Upper jaw ...	Corner.	Lateral.	2 Centrals.	Lateral.	Corner.
Lower jaw ...	Corner.	Lateral.	2 Centrals.	Lateral.	Corner.

The Age.

The teeth appear as follows:—

At birth, as a general rule, none of the teeth are through; but in about a week the 4 central milk incisors are cut, and the 1st, 2nd, and 3rd temporary molars also appear. The upper incisors are generally cut a few hours before the lower.

At 4 to 6 weeks the 4 lateral milk incisors are through. The foal has now 20 milk teeth.

At 5 to 6 months the front edges of the central and lateral milk incisors are worn level.

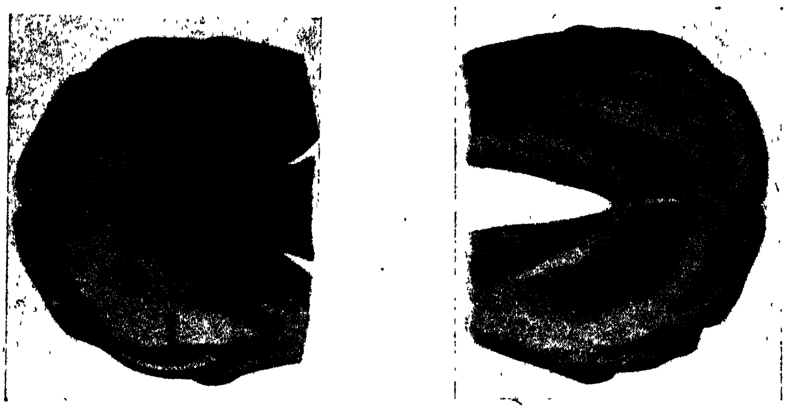
At 9 months old the 4 corner milk incisors are through, and the foal has 24 milk teeth.

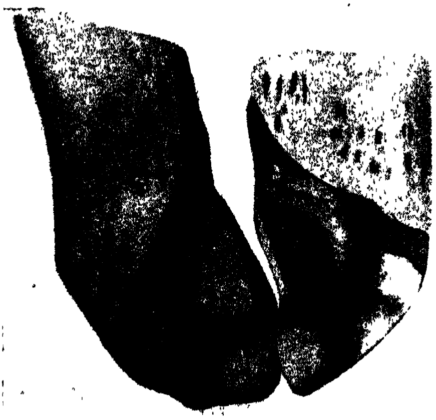
At 1 year the 4th permanent molars, 4 in number, are cut; the corner milk incisors are well up and shell-like in appearance. The colt has now 28 teeth, 24 milk and 4 permanent.

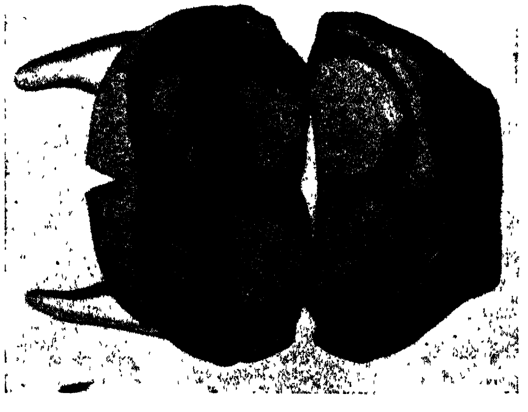
At 16 months all the milk incisors are level, and those of the upper jaw are in contact with those of the lower.

Illustrations of the teeth of the horse up to this age are now given, and the subject will be continued in a future issue. The pictures are taken from "Veterinary Notes for Horse Owners," by Captain M. H. Hayes, and "The Exterior of the Horse," by A. Goubaux and G. Barrier.

(*To be continued.*)







MOUTH AT BIRTH.

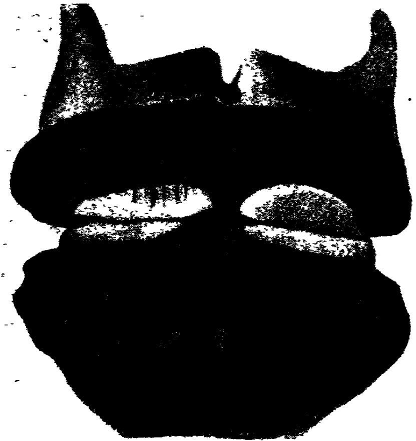
[*After Goubaux and Barrier.*]

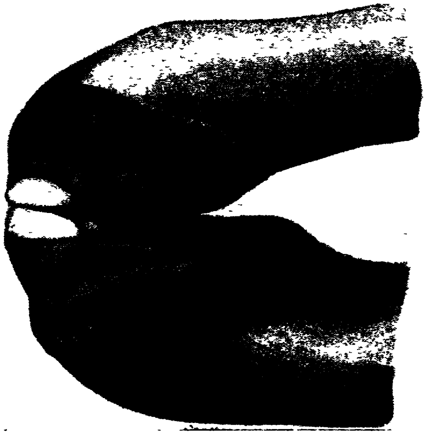
As a general rule, none of the teeth are through.

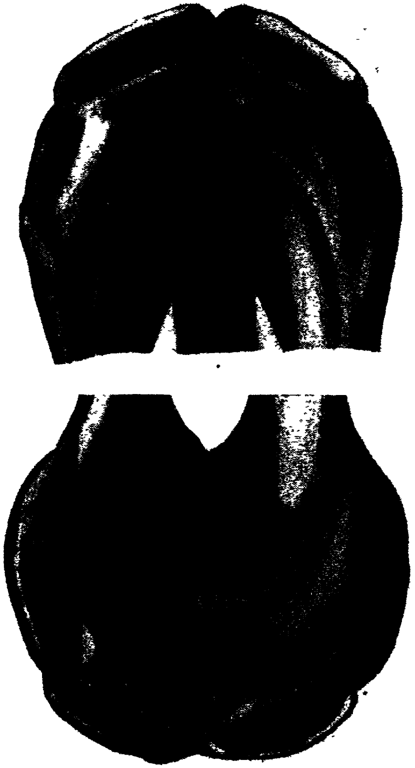
MOUTH AT ABOUT ONE WEEK.

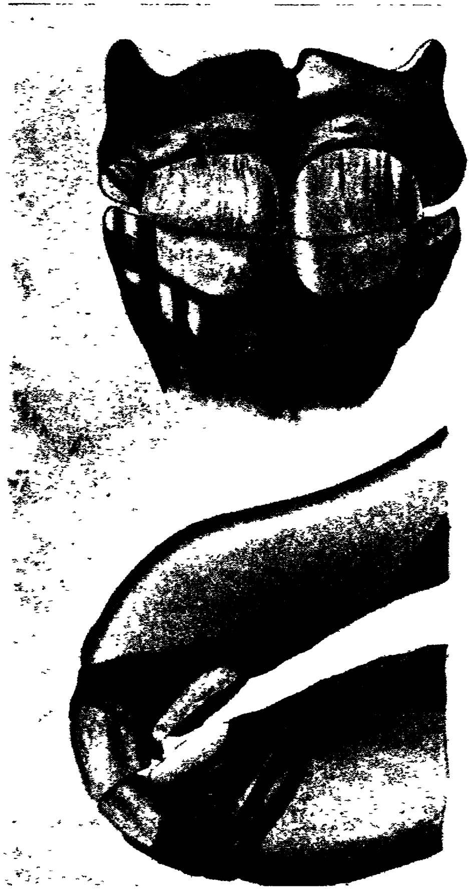
[*After Goubaux and Barrier.*]

The four central milk incisors are cut; the upper ones generally a few hours before the lower ones. The 1st, 2nd, and 3rd temporary molars also appear about this time.





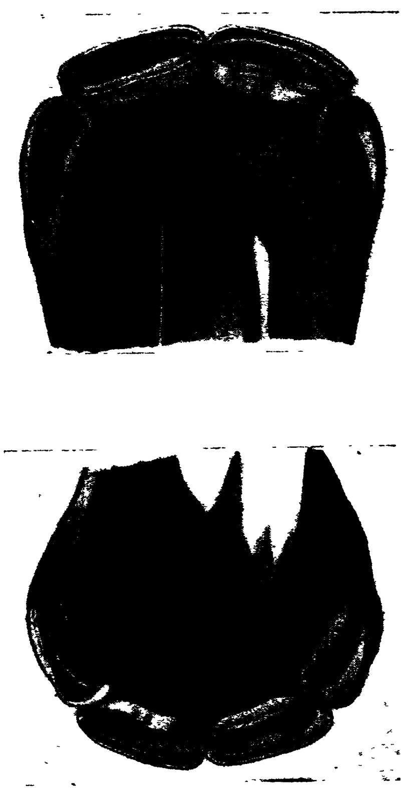


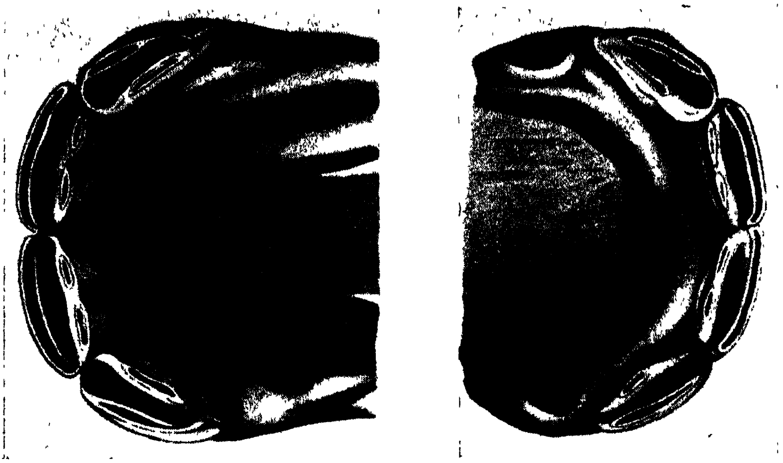


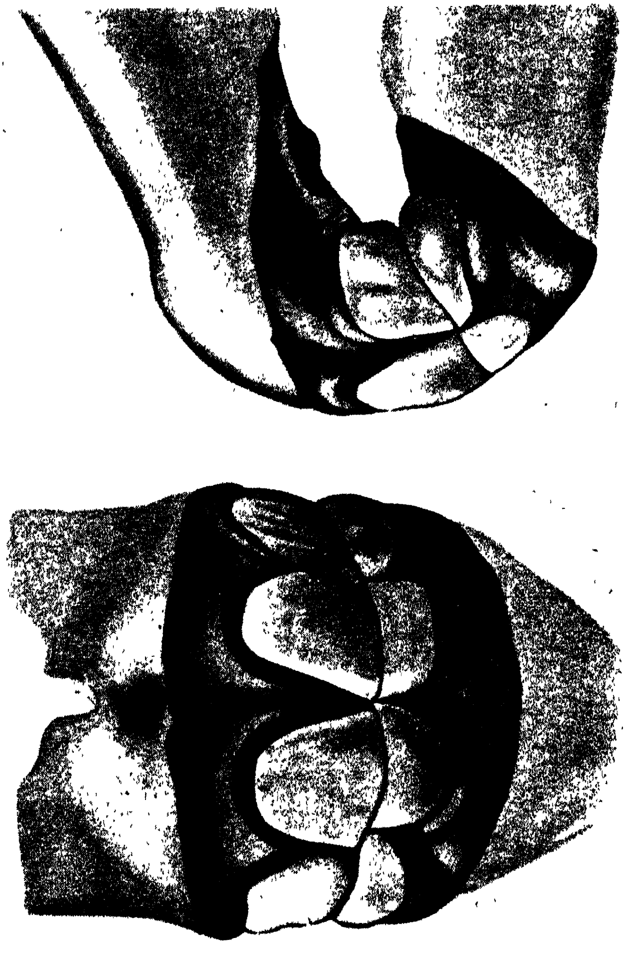
MOUTH AT
FOUR TO SIX WEEKS.

[*After Goubaux and Barrier.*]

The four lateral milk incisors are through. The foal has now twenty milk teeth.



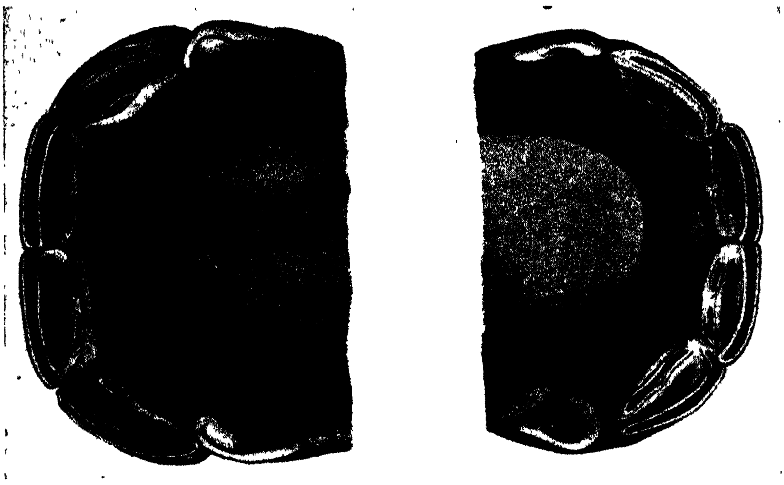


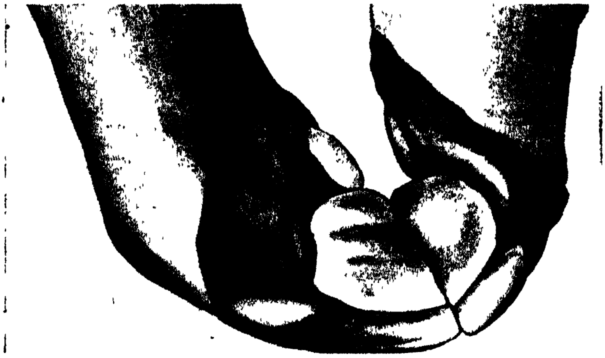


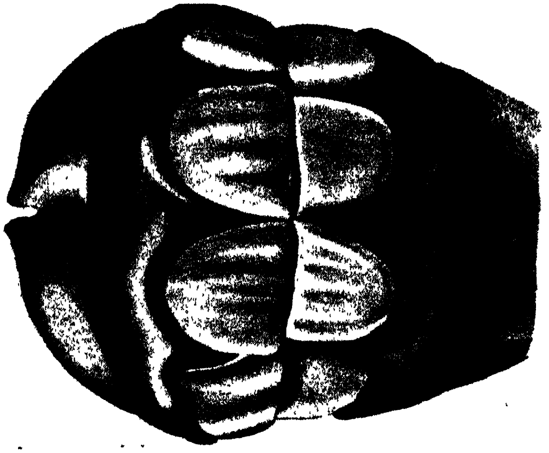
MOUTH AT FIVE OR SIX MONTHS.

[*After Goubaux and Barrier.*]

The front edges of the central and lateral milk incisors are worn level.



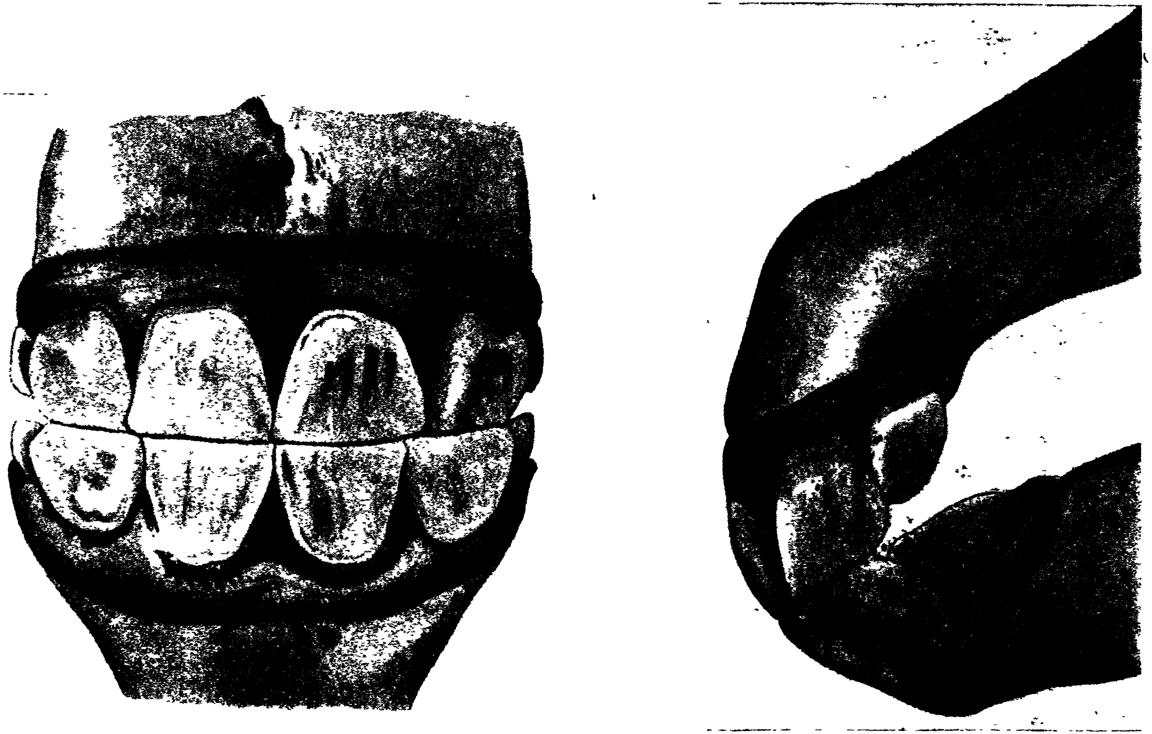




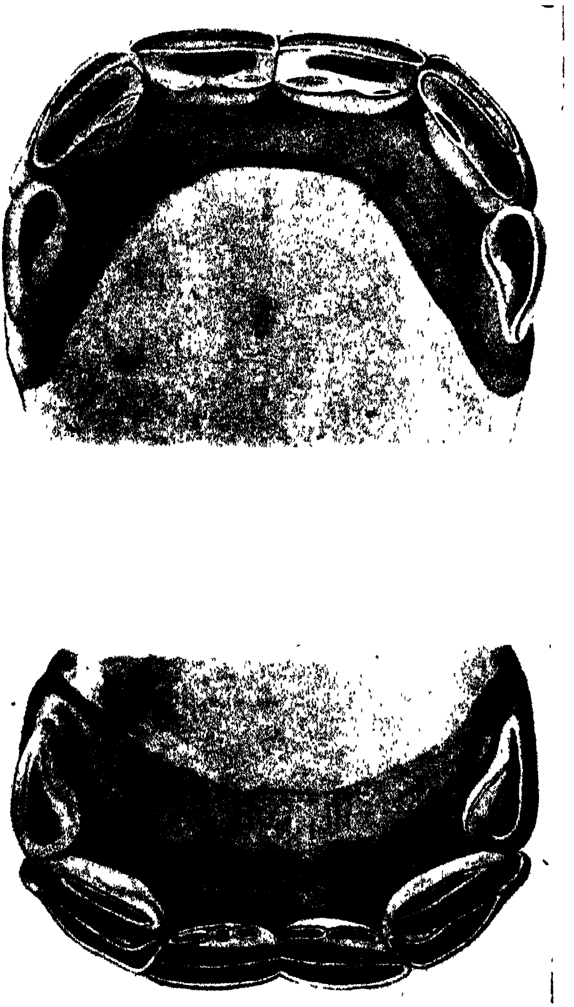
MOUTH AT NINE OR TEN MONTHS.

[*After Goubaux and Barrier.*]

The four corner milk incisors are through, and the foal has twenty-four milk teeth.



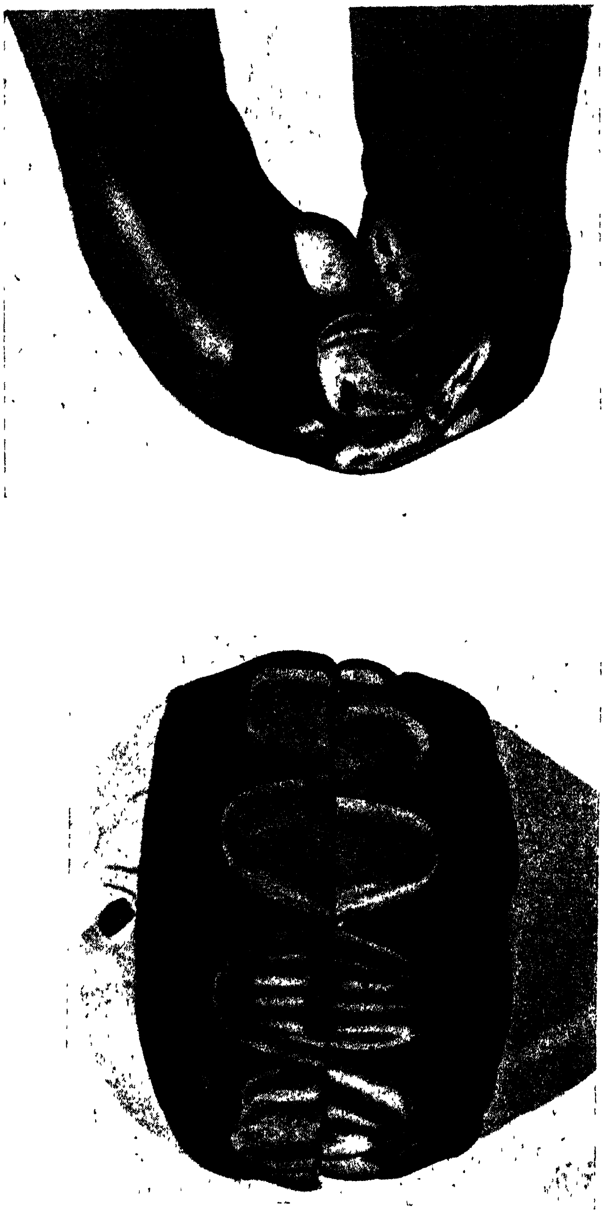
ONE YEAR.



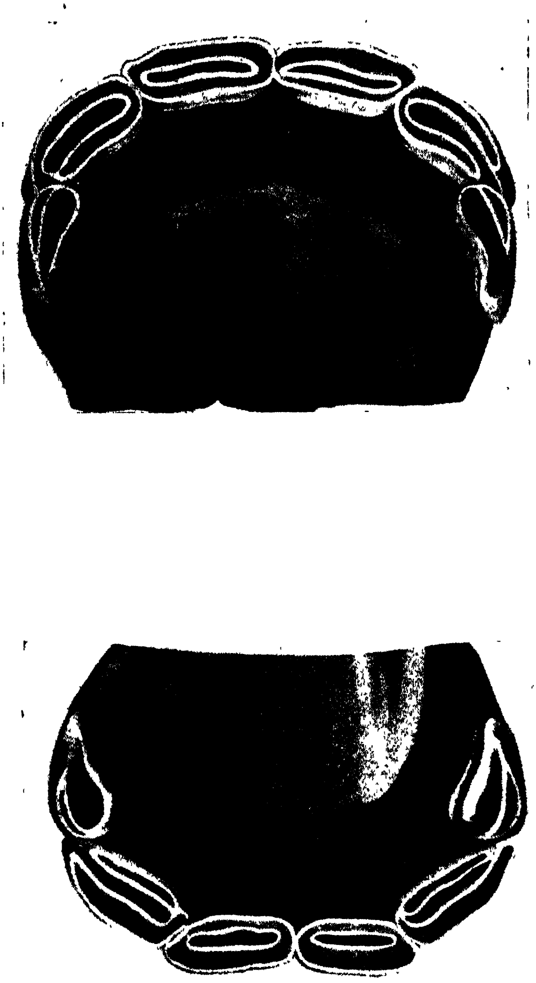
MOUTH AT ONE YEAR.

[*After Goubaux and Barrier.*]

The 4th permanent molars, four in number, are cut; the corner milk incisors are well up and shell-like in appearance. The colt has now twenty-eight teeth, twenty-four milk and four permanent.



SIXTEEN MONTHS.



MOUTH AT SIXTEEN MONTHS.

[*After Goubaux and Barrier.*]

The milk incisors are level, and those of the upper jaw are in contact with those of the lower.

Methods of Preparing Bordeaux Mixture.

In the *Gazette* for October, 1910, page 909, reference was made to the investigations of Mr. S. V. Pickering, F.R.S., of the Woburn Experiment Fruit Farm, England, with Bordeaux mixture, and to his recommendation that lime-water (a solution of lime in water) be used in place of milk of lime (a suspension of lime in water). Some experiments have been made at Glen Innes Experiment Farm orchard to ascertain whether Bordeaux mixture prepared in this way has any practical advantage over the ordinary mixture, but the results have not been definite. The tests have been made against apple mildew—a foliage fungus, and it has been very difficult to say whether either of the mixtures has been beneficial. The orchardist, Mr. W. Le Gay Brereton, suggests that experiments be carried out in a locality where apple black spot is prevalent, as results can then be measured by counting the fruit.

In the first trial, the lime-water was made by slacking 3 lb. of fresh lime in a little water, and stirring it well into 120 gallons of water. This was allowed to settle until the water was quite clear. Such a method would require almost all the lime to entirely dissolve in order to give a saturated solution. It was found that 86 gallons of this lime-water would not neutralise all the copper sulphate (6 lb. 6½ oz. dissolved in 3 gallons of water). Mr. F. B. Guthrie, chemist of the Department, recommended that the lime-water be made as is done for medicinal purposes, by allowing a good excess of lime to stand in contact with water. Put 2 oz. of slacked lime into a stoppered (or corked) bottle, containing 1 gallon of water (rain-water for preference); shake well for 2 or 3 minutes, and allow to stand for 12 hours. The excess of lime will have settled out, leaving a saturated solution of lime-water, which may be poured or syphoned off as required.

When the experiments were repeated this year, check blocks were treated with ordinary Bordeaux mixture in two different strengths, 6·5·40 and 6·5·50 respectively. The difference between the results from Pickering Bordeaux mixture and the other mixtures used were so slight and inconsistent in checking powdery mildew on apple-trees that it is impossible to draw any definite conclusions. In some cases the results were slightly in favour of Pickering's mixture, in others slightly in favour of ordinary Bordeaux mixture.

The matter is not being left in this uncertain state, but further experiments will be made to enable more definite conclusions to be drawn.

A Weevil (*Æsiotes leucurus*, Pascoe) destructive to Pine-trees (*Pinus halepensis*).

WALTER W. FROGGATT, F.L.S., Government Entomologist.

THIS handsome beetle was described by Pascoe, from specimens sent to him from Sydney by Mr. George Masters, curator of the Macleay Museum, in a paper entitled, "An Addition to the Australian *Curculonidæ*, Part V," which was published in the Annals and Magazine of Natural History (Vol. XII) in 1873. Mr. Masters informed the describer that it was "very destructive to introduced conifers." As far as the writer's experience goes, this is a comparatively rare insect, and only two specimens were in the Departmental collections until this last month, when specimens were sent in from Strathfield, where they were reported to be destroying every pine-tree in a fine avenue in that neighbourhood.

My assistant paid a visit to the residence of the gentleman who sent the specimens, and found every tree more or less infested with the larvæ, pupæ, and perfect beetles, in all stages of development. It is evident that, from the enormous number of larvæ that have been destroying the bark and pupating in the sapwood, nothing can save this fine avenue, containing about 40 trees, planted eight years ago.

The eggs are deposited upon or just in the surface of the bark, where the rather large, legless, naked grubs feed between it and the sapwood. When full grown they eat a shallow cavity in the sap-wood, and form a regular and very neat elongate oval cocoon, out of shreds of sap-wood, as shown in the plate.

The beetle, which measures slightly over half an inch in length, is of a general dull chocolate brown tint, mottled with fine white scales, forming spots on the head and blotches on the legs and under surface of the body, with the apical extremity of the wing-covers almost pure white. The curious and distinct colouration, with the hood-like projection of the prothorax over the head, and the two stout blunt spines projecting from the white area on the extremity of the body, give this fine weevil a very striking appearance.

The genus to which it belongs, *Æsiotes*, was created by Pascoe, for a species (*Æsiotes notabilis*) described by him from the Pine Mountains, Southern Queensland, in 1865 (Journal of Entomology, Vol. II, p. 422.) A third species was obtained by Mr. C. French upon some young gum-trees (*Eucalyptus viminalis*), near Melbourne, and Pascoe named it *Æsiotes morosus*. This species is somewhat larger, and also differs from the other two in having a narrow crest-shaped protuberance on the middle of the rostrum, and in the different form of the apex of the thorax.

Preventives and Remedies.

A timber pest, particularly when it is a wood-boring larva, is always a difficult pest to deal with, and it is very remarkable that a beetle that Masters recorded as an enemy to introduced pine-trees as far back as 1873, should now turn up literally in thousands upon these trees. The pine-trees often appear to die out in New South Wales when they reach maturity, probably on account of unsuitable soil or too hot a climate, but these trees at Strathfield are, comparatively speaking, young trees.

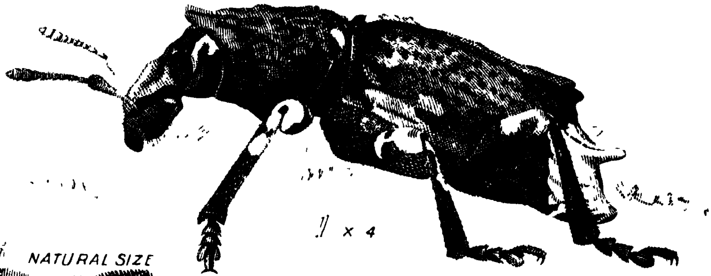
If the beetles had been noticed when they first appeared, it might, with a little trouble, have been possible to kill them under the bark, by going over the trunks with a small chisel or gouge and tapping them out, as is done by the orchardists for the "orange-stem borer." If the trees are not too deeply injured in the bark they may recover this season, but if all the beetle larvæ and pupæ in the timber at the present time, emerge, when perfect beetles, and reinfest the trees with their eggs, the next season will certainly end the life of the trees. We propose to see if the adult beetles could be trapped on the tree trunks, by putting bandages or sheltering places for them to hide in during the day when not feeding, where they could be sought, collected, and destroyed.

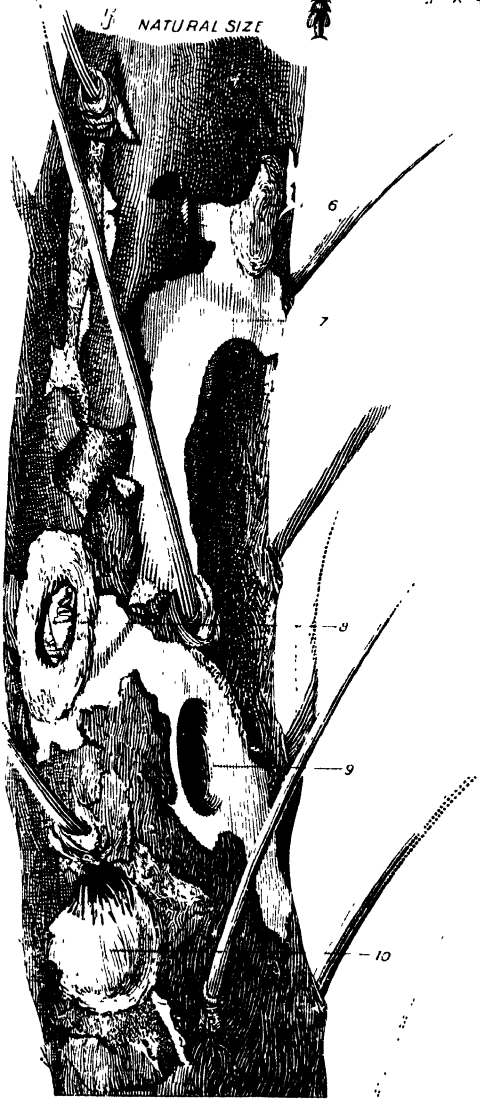
WHEAT MEN!

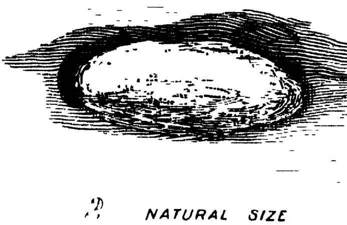
WORK YOUR FALLOWS!

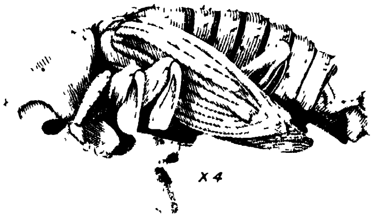
Dept of Agriculture NSW
JANUARY 1912

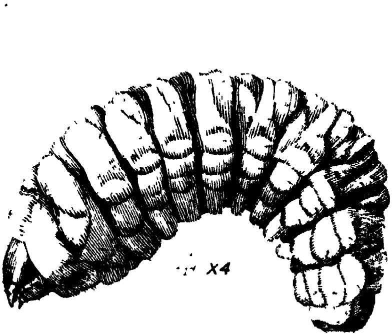
SUPPRESS WEEDS;
CONSERVE MOISTURE;
SECURE GOOD CROPS NEXT YEAR.











WEEVIL DESTRUCTIVE TO PINE-TREES (*Pinus halepensis*).

1 Adult Weevil (*Æsiotes leucurus*, Pasc.)
2 Cocoon
3 Pupa (magnified 4 times).
4 Larva which does the damage by boring (magnified 4 times).

The Vine in Australia.

[Continued from Vol. XXII, page 1093.]

M. BLUNNO, Viticultural Expert.

Soil for the Vine.

OF all plants the grape-vine is, perhaps, the least exacting in matter of soil. It will grow anywhere except in low-lying land where the ground is damp all the time. Unless well-drained, such soils cannot be utilised for vines, or for any other plant the roots of which reach a relatively great depth. The roots would soon be affected by the white-rot disease (*Pourridié*), caused by several fungi which are most destructive in a damp soil. Their vegetation is poor, the foliage and shoots are limited in length, vigourless, yellow, and watery; canes do not summer properly; the vine is liable to Anthracnose (black spot), to oïdium, and to chlorose, and is apt to catch any new pest due to fungi or insects that may appear in the locality. Grapes ripen badly, the juice is poor in sugar and grape acids, and watery, and the wine derived from them is nondescript, flat, and will "turn," or otherwise go wrong.

With the exception of such soils, vines grow well in the greatest variety of ground, although its chemical composition confers on the wine a special character, according to the predominating ingredient. The fertility of the ground and its mechanical texture have an undoubted influence on the general quality of the wine.

In light or medium soils, well drained, sloping rather than flat, though the vine does not attain a great vigour, and the yield is not very large, the wine is always of high quality. In such soils it is best to plant those kinds that local or foreign experience have recognised as being fine sorts—such as Hermitage, Cabernet Sauvignon, Malbec, Verdot, and Pinot Noir among the black grapes already cultivated in Australia; and Merlot, Nebbiolo, Dolcetto, San Giovese, Cesanese Nero, and Vernaccia Nera among those kinds not yet known here, but which are worth trying in this country. Among the white grapes, Madeira *syn.* Verdelho, Semillon, Riesling Tokay, Pinot Blanc, White Hermitage, and Chasselas are already popular in Australia; and Sauvignon Blanc, Savagnin, Vermentino, Cesanese Bianco, Vernaccia Bianca, and Albanello are among those not yet cultivated or little known, but are also worthy of attention.

On rich soil on alluvial flats, where vines crop abundantly, it is better to prefer kinds that are known to be heavy bearers, such as Aramon and Lambrusquat *syn.* Mataro among the black grapes; and White Shiraz, Gouais Blanquette, and Folle Blanche among the white ones already cultivated in this continent. They will make good *vins ordinaires* in good seasons, and if the season be at all unfavourable the wine can be distilled and turned into brandy.

Even a sloping ground may lack a good natural drainage if the soil be too clayey, in which case drainage becomes indispensable. In soils so located, however, natural drainage is sufficient if the ground is of medium texture.

It is better for the quality of the wine if the soil is rather inclined to be dry than wet, for the roots of the vine can penetrate to a great depth, and there find the moisture they require.

A damp soil is cold; the roots in such soil cannot attain the necessary development to feed the upper portion of the vine; the function of the leaves, being stimulated by the higher temperature in the air, would miss the necessary co-operation of the parallel and equally intense function of the roots. The soil should easily get warm with the return of spring, so that, with the canes, the roots should simultaneously start their vegetative functions. Only a well-drained ground, well broken and stirred, regularly worked, in which air is mixed and circulates, can readily respond to the kissing of the sun.

Soils of light colour are colder than those red or dark. Sloping ground with a sunny aspect is warmer than flats, although in the hotter countries of the temperate zone the question of aspect, as already stated, has no importance.

The chemical and mineralogical composition of the ground has a great influence on the quality of the wines. In sandy or pebbly soils, especially if the sand be of siliceous nature, wines are lighter in colour, but have a pronounced and finer bouquet.

Wines have also a fine bouquet, and are rich in alcohol and colour, when they are obtained from volcanic soils. Soils originating from the decomposition of granite or mica-schists contain much potash, and also sand. Clayey soils produce wines heavier in colour and in body. Limestone soils give wines rich in alcohol, also fairly heavy in colour, and smooth to the palate. Fine delicate white wines are obtained in soils originating from the decomposition of dolomites. Soils rich in phosphoric acid also produce high-class wines, chemical analysis having shown that, in the majority of cases, quality ranges with the proportion of phosphoric acid contained in these soils.

Where the soil is rich in organic matter (humus), vines grow luxuriantly, and give extraordinarily heavy crops, but the wines, whether red or white, are of inferior quality.

It may be of interest to mention the nature of the ground of the most noted vineyards in the world, which will show how the very finest wines can be made in a variety of soils. The most famous vine district in the world, Médoc, but a few miles from Bordeaux, is nothing but a mass of pebbles. The wines of that locality, apart from their nomenclature, which in the majority of cases is after the name of the vineyard or manor itself, are classified in a more general way thus:—Wines of the Palus; wines of the Côtes; wines of the Graves (pronounced "Grahv"). The Graves are a number of places close to one another within the municipal territories of Pauillac, Margaux, and Pessac, where nothing is to be seen in the way of soil but downs of pebbles of various sizes. It is impossible to see a particle of real soil among the pebbles of the vineyards of the four greatest Bordeaux wines, viz., Châteaux Margaux, Château Lafitte, Château Latour, and Haut Brion, till a certain depth is reached. The writer, sliding down the side of a ravine, could see nothing but a huge layer of pebbles fully 25 feet from the surface, and then some green clay, like a kind of marl, began to mix with the pebbles, increasing in proportion as greater depth was reached. Conglomerates of marine shells, clay, and pebbles were common down the ravine. The quality and just renown of the Graves vineyards ranges according to the proportion of pebbles in the soil, which represents 71 per cent. and over of the soil. In the case of the four above-mentioned vine districts, the layer of almost pure pebbles is so deep that it cannot be supposed the roots could reach such depth.

In the municipality of Pessac, close by the famous Haut Brion, there is a vineyard which gives a first-class wine, but below the standard of the latter. The layer of pebbles is not so deep, and the roots of the vine can easily reach a layer of clay. This wine is certainly stronger in alcohol than the Haut Brion, but does not attain its delicacy of taste and bouquet.

The soil of the most famous Médoc vineyards contains as much as 85 per cent. of pebbles—smooth, white pebbles, of a size varying from half an inch to 2, 3, and 4 inches in diameter.

The Côtes, in the Gironde district, come next to Médoc in the production of those fine wines that are known under the general name of Bordeaux wines. The Saint Emilion wines come from the Côtes. The soil here contains an average of 38 per cent. of pebbles.

The Palus wines come far behind those of the Côtes. They are a very bad third in the classification of the wines of the Province of Bordeaux. Frenchmen speak of the *vins de Palus* with a contemptuous smile and a shrug of the shoulders. They are wines from low-lying flats, the soil of which is a stiff, cold, and damp clay, with all the disadvantages described in the foregoing remarks; but many of these flats have gradually been drained, and the wines produced have very much improved. The vines on these flats were always frost-bitten in spring; the grapes ripened badly, and late in autum. Since the drainage they escape frosts, while the crop matures better and is a fortnight earlier.

It may seem strange, yet it is a fact positively proved by centuries of experience, but all wines of great renown come from vineyards the soil of which contains pebbles or some fragments of other kinds of stones. Such soils would be unfit for anything else, but in wine-drinking countries they are worth fabulous prices.

There is another district in France famous for its wines, and that is the Côte d'Or, in Burgundy. The wines of Volnay come from soils containing 30 per cent. of oolitic stones; those of Pomard from soils with 29 per cent. of stony débris; while the plains of Beaune contain over 52 per cent. of large and small pebbles. At Epernay, in the Champagne country, the soil in many places contains 56 per cent. of hard limestone fragments, mixed with clay.

The Saumur district is famous for its white wine. Here, again, the soil of the best known vineyards is mixed with a large proportion of pebbles. Frontignan and Lunel, in the south of France, are noted for their Muscat wines; and here also, rolled quartz is in evidence in the ground of the best vineyards.

The soil in the Rheingau is, in part, a clay schist, derived from the disintegration of the Rhenish slate, mixed with free quartz and iron oxide. In other parts it is a loam, formed by a mixture of clay, marl, and gravel.

The district of Jerez de la Frontera, in Spain, has earned a reputation for its sherries. The ground there is a mixture of clay and sand; chalk-rock is interspersed, also gypsum and iron oxide. In other parts of the same district the soil is mostly sand, mixed with clay impregnated with iron oxide, which gives the soil a reddish tint; or the soil is whitish where the sand is only mixed with clay and chalk, without oxide of iron.

The soil of the Alto Douro, in Portugal, where port wine comes from, is a clay from a schist formation.

Marsala is a type of Italian wine closely allied to the sherry, but sweeter and softer than the latter, and is often sold as sherry in England. The soil around Marsala is a reddish clay mixed with gravel.

Chianti is another Italian wine; but it is a claret famous for its quality, and for the peculiar flask in which it is sold. The flask is of clear white glass, with a big belly, protected by a jacket of pleated straw, a kind of small demijohn, with a long narrow neck. Chianti is a valley in the province of Siena, in the Tuscan Appennine. The sides of the hills there are all terraced. The soil is clayey, the clay being derived from the gradual disintegration of the *galestri*, or chips of the rocks, which are principally composed of silicate of alumina. When a vineyard is to be planted, the hillside is generally terraced. The rock is blasted with gunpowder, and with the bigger stones the wall of the terrace is formed. It is a *dry wall*, to translate the Italian expression literally, that is, the stones are ranged and laid without mortar. Vine cuttings are thus planted in a soil which is essentially composed of sharp fragments of rock, the *galestri*. With them are to be seen, especially on the surface, for some years after the making of the terrace, quite big angular stones, which make walking very tiring and even painful for the visitor.

In the foregoing notes I have given pre-eminence to the influence of smooth pebbles, quartz, or other stoney fragments in the soil on the palatable character of the wine, especially as regards the bouquet. Ground in which they are freely mixed keeps the moisture better than other soils, other circumstances being equal. Everybody must have noticed when removing a stone that the ground under it is moist.

When white pebbles or stony fragments are on the surface, they reflect the heat of the sun, which is a great advantage in climates where grapes are not likely to acquire a sufficient degree of ripeness. In hot districts, however, they may cause the shrivelling up of the grapes; hence the necessity of training the vines fairly high from the ground. Black soils get warm much more quickly than pebbly or stony soils, or soils of lighter colour, but they do not retain the heat so long as the latter, which get warm very slowly.

I have already stated that it is generally proved by long experience that limestone in the soil causes wine to contain a larger percentage of spirit. Clay gives the wine body and colour, especially if impregnated with iron oxide. If quartz prevails in the shape of pebbles, fragments, or sand, the wine, although lighter in colour in the case of red wines, and lighter in body and spirit, is always superior in its bouquet.

In some parts of the country in the Bordeaux district, known as "Landes," the soil is eminently sandy, as at Cestos, Martignac, and Mimizan. The wines there, although very light, have a very delicate bouquet. The wines made on the dunes of Cape Bréton have the bouquet and taste of Bordeaux, with the richness of Burgundy. The analysis of such sands show that they contain 98·8 per cent. of pure hyaline quartz sand, and 1·2 per cent. of fragments of sea-shells. Vineyards have been established there since the fifteenth century, though the sand is very shifty.

In Burgundy, the famous Romanée-Conti and Chambertin come from soils containing 75 and 89 per cent. of pure sand respectively. In the Beaujaulais district, soils containing 68 per cent. of siliceous sand are to be found, which produce fine wines. Romanéche supplies wines with sufficient body and alcoholic strength, but especially with a fine bouquet, from soils containing over 81 per cent. of sand.

The fine wines of Chateaneuf-du-Pape are produced in soils with from 74 to 78 per cent. of sand ; the Johannisberger in soil with 73 per cent. ; the wines of Worms, surnamed *Liebfrauermilch,* in soil with 68 per cent. of siliceous sand.

Those acquainted with the organoleptic description of the quality of wines, often express with the word "flinty" a peculiar sensation of the palate when tasting some old wines from certain districts. It is a fact that some wines impress the palate with a complex, pleasant sensation, from which often stands out a suspicion of that received when licking a piece of flintstone. Œnologists generally attribute that to the predominance in the soil of quartz in some state of disintegration, since it is in old wines obtained from such soils that the peculiar quality is fairly constant, and chemical analyses have also proved that silicon is found in such wines in larger proportions than in others.

The spread of *Phylloxera vastatrix* through vine-growing Europe and other countries, including ours, gives barren sandy soils a great value to those who intend to plant a vineyard, and who are either in a phylloxera-infected district, or in a district menaced by the scourge. A 5-acre vineyard of table grapes, near Glenfield, is all in a fine sand, except a small piece in a corner, where the subsoil being clayey and rather close to the surface, the clay was trenched and mixed with the sand prior to planting. The vines growing on that piece became infested with phylloxera, while all the vines planted in the sand were never affected. Sandy soils and sand wastes are being utilised for vine-growing at Elderslie, near Camden, were there is a fairly extensive zone of poor white sand, which is not river sand. Some growers of table grapes have planted their vineyards in it and wish for no better soil.

Several wine vineyards are also entirely, or partially, in sandy soils, such as Messrs. Penfold's, Dalwood ; Mr. Wyndham's, Fernhill ; Mrs. Kelman's Kirkton vineyard, near Branxton, in the Hunter River valley ; Messrs. Raymonds' and Mr. C. Gaymard's, near Forbes ; Dr. Ch. Fiaschi's, Tiwhana, near Windsor, New South Wales; and Messrs. Hardy's, Tintara, in South Australia. In the *Gazette* for July, 1910, page 611, under the heading of "Barren Sands, Vine-growing, and the Phylloxera Question," I gave an idea of how sandy wastes are utilised elsewhere on a large scale for profitable wine-growing, because of the immunity enjoyed by the vine in certain sandy soils. The matter is of such importance that some extracts are given here. Those who wish to read the whole article, and cannot obtain a copy of the July, 1910, *Gazette*, may obtain the article in pamphlet form by writing to the Under Secretary, Department of Agriculture, Sydney.

Fineness of Sands endowed with immunity to Phylloxera.

The sands that have proved to possess the highest resistance or absolute immunity are formed of fine even grains, round and well levigated, with a diameter ranging froom $\frac{1}{200}$ to $\frac{1}{50}$ of an inch. They must be siliceous sands, *i.e.*, of the nature of quartz. They must also have a fairly continuous supply of moisture, either rising from below by capillarity or by being in a district where rain is not too scarce. The colour of the sand is not much to go by, for there are resistant or immune sands—grey, reddish, or pale yellow. The bigger the grains, the lower the resistance, especially if they are very sharp. The sharper the sand, the weaker and more uneven the action of capillarity, because a number of interstices remain unfilled with water, and in these phylloxera find enough air to breathe. The minimum proportion of sand of the kind already described that a soil should contain is from 60 to 70 per cent., provided that the balance is not all made up with an ingredient of binding nature like clay. A rough-and-ready way of judging whether a sandy soil is likely to be resistant or not is to damp it, and then press some of it between the tips of the fingers, afterwards placing it on a board. If the shape soon crumbles, that soil is sure to resist. The information given above should be borne in mind by those who have sandy soils, because often some think that their ground is sandy, when really it is sandy loam. I have seen a vineyard right on the left bank of George's River, near Liverpool, where the sandy soil was well impregnated with fine black silt; the vines there all perished through phylloxera, and the vineyard has been reconstructed since with resistant stocks of the Riparia and Riparia x Rupestris types, which grow splendidly. Another vineyard on the right bank of the same river, near Casula, was in a sandy soil also impregnated with silt, but the sand was of fairly big grains, and very coarse and sharp. When fairly wet several grains would bind together and form solid lumps. Phylloxera was found on several vines scattered throughout the plantation.

How to prepare sandy ground before planting.

From the foregoing it naturally follows that when a layer of suitable fine sand only, say, 12 inches deep, rests on a subsoil formed by coarser sand, sand mixed with clay, or mostly clay, or *vice versa*, when the suitable sand is underneath a heavier surface layer, in breaking that ground the surface layer alone should be ploughed; and it it be desired to disturb the subsoil, then the subsoil should only be broken with a subsoil plough, so as not to mix sand and clay. The sand layer, if it be on the surface, will act as a protector, not allowing phylloxera to reach the heavier ground underneath; and if it be below the surface layer, it will allow the roots to grow there within a non-infected medium; in fact, all the roots will be found there, and none on the surface.

It is evident from this explanation that the quality and quantity of sand in a soil are the cause of resistance, and in many cases of immunity; also that in the case of sands enjoying immunity the proportion of the other soil ingredients is so small as to render necessary good manuring to increase and maintain their fertility. Vines throw their roots far, wide, and deep, so they feel much less the poverty of a soil. River sands are always richer than sea-sand, for, in the first instance, there is a quantity of silt, which, however, may lessen more or less the resistance of the sand. The sands of the Rhone Valley, in France, have all been planted with vines, and some of them for nearly thirty years have defied phylloxera.

At Elderslie, near Camden, in this State, there is a vineyard of table grapes planted by Mr. J. Bruchhauser thirty-three years ago in a fine sand. It is still in bearing, although an adjoining piece in a clayey loam became infested with phylloxera and was killed by this pest twenty-nine years ago; in fact, it was the first outbreak of phylloxera reported in New South Wales.

The best and immediate results in the south of France were given by those sands that had been under cultivation for some time before, the madder being the chief plant grown till the vines transformed all that barren country.

One would naturally think that, in view of the lightness of sandy soil, it should hardly be necessary to break up and disturb the ground to any great depth. The late Professor Foëx, Director of the Viticultural College at Montpellier, pointed out that ploughing and then subsoiling are of the greatest importance, and have much influence on the future of the vineyard, and he advised subsoiling as deep as 20 inches. He goes further still, and would have men following the subsoiler and shovelling out *pelleversage*—the deeper layer of the sand—to fill the next row, thus putting the surface layer at the bottom, and *vice versa*. The opinion of M. Foëx is of great weight, for, apart from being the most eminent authority in viticulture up to the time of his lamented death five years ago, he was connected directly or indirectly with the utilisation of those sand dunes at Aigues-Mortes and in the Camargue. He also points out that the accumulation of humus, consequent upon the successive cultivations of madder and a few other plants that preceded the vineyard, did not in any way impair the resistance or immunity of those sands. Applications of stable or fish manure, sea-weed, or oil-seed cakes are very strongly recommended for such sandy soils, without any fear of altering their mechanical texture, and naturally, chemical fertilisers are also most effective.

The sole inconvenience of sandy soils is that strong winds are apt to blow the sand about, especially during the early period, when the vines are yet small. Planting the vine in the quincunx form is one of the expedients to allay the effects of the winds. If the vines be trained on trellises, then the trellises should be run in a direction aslant with that form from which the worst winds blow, in order that the wind may not blow straight in between the rows. Let each trellis shelter the next one.

After the disturbing of the sand prior to planting, it is better to reduce the tillage to a minimum. Poor sandy soils grow no weeds, and their mechanical texture is such that they require no ploughing or scarifying to mix air in the soil, or destroy capillary action near the surface. It is enough to watch and prevent the spreading of couch grass, which can be done by hand with a hoe. Thus the sand, deeply disturbed before planting, gradually sets, and forms a levigated surface, which offers the wind little hold. Some weeds, however, will also grow after the vineyard has been established a while, seeds being brought specially by stable or other form of manure. Scarifying will become necessary, but it is advisable to postpone this operation till the period of strong winds is over.

Summary.

In this and in the previous chapter, I have laid stress upon the influence of soil and climate on the quality of wines. Before closing the argument, I shall try to summarise the questions discussed in the two chapters. As one comes nearer to the equator, all other conditions being equal in regard to soil, aspect, and variety of grapes, the grape juice will contain more sugar, and, therefore, the wine will be stronger in alcohol. This means that the alcoholic strength of the wine depends more on the climate and less on the other conditions. This explains why, in a warm sunny country, wines with sufficient alcoholic strength are obtained from some light soils, which, in a climate less favoured by sunny days, give wines flat, indifferent, and hard to keep. When clay and limestone soil, warm climate, and particular kinds of grapes all concur, then the wines resulting are very strong in alcohol indeed.

For the production of claret and fine white wines, as for the production of *vins ordinaires*, an alcoholic strength of from 17 to 20 per cent. of proof spirit is quite sufficient; therefore, light soils should be preferred by any grower desiring to produce such wines, if he be working in a district in which, on account of its rather warm climate, rather heavy wines are generally produced. *Vice versa*, in cold districts, where grapes would just reach sufficient ripening for the production of light wines, a heavy ground, especially if containing much limestone, should be preferred instead of light soils. A vigneron desirous of producing strong, heavy wines, either for blending purposes or for the production of dessert wines, dry or sweet, should not only plant his vineyard in a warm district like, say, our Riverina, without an excessive rainfall, but he would do well to prefer a heavy ground.

Generally speaking, and within certain limits, the stronger a dry wine is in alcohol, the less is its softness—its *moelleux*, or velvety taste, as it is expressed by our wine merchants. Strong wines, either for blending or for the manufacture of dessert wines, such as sherries, ports, muscats, &c., belong to classes other than the table wine types, and other characters are looked for in regard to body, flavour, or aroma, and alcohol.

(To be continued.)

The Peach.

[Continued from Vol. XXII, page 1084.]

W. J. ALLEN.

Varieties.

THE best varieties to plant will, of course, vary with the district. They will also, as indicated at the beginning of last article, vary with the purpose for which the fruit is being grown.

It is not desirable to plant a whole orchard of one variety of peaches. The question of cross-pollination is not yet fully investigated, but it is now well known that a shy cropper will often bear if another variety is planted alongside. It is therefore desirable to change the variety every third or fourth row.

The following varieties are first-class peaches, and have done well at the Hawkesbury Agricultural College. In making a selection from these the grower should first ascertain from his neighbours which of them are doing best in the locality. It is useless to plant a variety which grows well in the district, but does not yield the best class of fruit; but it is equally wrong to select a variety for its merits as a peach without reference to whether it will suit the conditions under which it is to be grown:—

Edward VII.—A very early peach; flesh white; very red near the stone; medium size; freestone; dessert. Ripe, 26th November, 1910.

Triumph.—A yellow-fleshed peach; large, and similar in shape to a well-grown Crawford, but darker in colour on sunny side; handsome in appearance; freestone. Ripe, 12th December, 1910

Kia-ora.—A yellow-fleshed peach, similar in appearance to Elberta, bears regular crops; fruit of fine flavour; freestone; dessert. Ripe, 17th January, 1910.

Wiggins.—An early freestone, of large size; handsome; flesh creamy white; a prolific bearer; most valuable as a market peach. Ripe, 27th December, 1910.

Roser.—A good late peach; freestone, of the best quality; rich, meaty, and juicy; large; colour pale; a first-class canning peach. Ripe, 19th February, 1910.

Lady Ingold.—A yellow-fleshed peach; fruit of large size; skin, rich yellow, crimson in the sun; freestone; fairly prolific; good market, canning, or drying peach; fairly productive. Ripe, 3rd January, 1910.

Lovell.—A large-sized, round, yellow, freestone; prolific; rich flavour; one of the best for canning, drying, or market. Ripe, 24th January, 1910.

Conkling.—A splendid yellow-fleshed peach, of largest size; freestone; good for canning, drying, or market; medium cropper. Ripe, 19th January, 1910.

Chair's Choice.—A late yellow-fleshed peach, of largest size; colour deep yellow with red cheek; flesh firm; prolific; good canning, drying, or dessert peach. Ripe, 24th January, 1910.

McDevitt's Cling.—A very fine clingstone, of good even shape; colour rich yellow with deep red cheek; crops medium; fruit enormous. Ripe, 1st February, 1910

Nicholl's Orange Cling.—Fruit of large size, quite round; skin deep orange, with a red cheek in the sun; flesh deep yellow and firm; a fine clingstone peach; medium cropper. Ripe, 1st February, 1910. (See coloured plate in last issue.)

The following additional varieties are selected from a list of suitable ones at the College in 1903, and are those which have maintained their good reputation ever since:—

Waterloo.—Ripened, 4th December, 1901, 11th December, 1902; fruit medium-sized; skin with a bright red cheek, which is mottled with dark red in the sun, pale greenish tinge where shaded; flesh with greenish tinge, and adhering slightly to the stone, juicy and richly-flavoured; medium cropper.

Governor Garland.—Ripe, 2nd December, 1901, 10th December, 1902; fruit large, globular; skin pale greenish white in the shade, almost covered with dark red in the sun; flesh whitish, fairly firm, very rich and juicy, but a little stringy; a good cropper; freestone.

Hale's Early.—Ripe, 17th December, 1901, 27th December, 1902; fruit large, melting, and very good, roundish; skin yellowish white, deep red in the sun; flesh white; good bearer; a very desirable peach; freestone.

Early Crawford.—Ripe, 3rd January, 1902, 10th January, 1903; fruit large, oblong, with a swollen point; skin rich yellow, with fine red cheek; flesh yellow, very rich and sugary; heavy cropper; a very desirable dessert peach, also for jam, drying and canning; freestone.

Royal George.—Ripe, 14th January, 1902, 20th January, 1903; fruit large, quite round and even; skin pale yellowish white, almost covered with fine rich red; flesh whitish, very tender and juicy; heavy cropper; excellent for table; freestone.

Foster.—Ripe, 6th January, 1902, 16th January, 1903; fruit large, slightly flattened; skin deep orange red, very deep red in the sun; flesh yellow, very rich, sub-acid flavour; good drying, jam, canning and table fruit; good cropper, and carries well; freestone.

Elberta.—Ripe, 18th January, 1902, 28th January, 1903; fruit very large, oblong; skin fine yellow, with rich red cheek in the sun; flesh yellow, fine-grained, firm; heavy copper; first-class for drying, canning, market, &c.; one of the best peaches of its season; freestone.

Susquehanna.—Ripe, 15th January, 1902, 22nd January, 1903; fruit very large, almost globular, very handsome, skin deep yellow, slightly red in the sun; flesh deep yellow, tender and melting; first-cass for canning, market, &c.; only a medium cropper, but of splendid quality; freestone.

California.—Ripe, 15th January, 1902, 22nd January, 1903; similar in shape, size, and colour to Susquehanna, the difference being that it is a cling and a very much heavier cropper; splendid for market and excellent canning; one of the very best clings known.

Christiana.—Ripe, 20th January, 1902, 30th January, 1903; fruit large, globular; yellow flesh, red around stone; a most delicious peach; good cropper; excellent for all purposes; freestone.

Brandywine.—Ripe, 20th January, 1902, 4th February, 1903; fruit large; yellow flesh, in appearance and flavour strongly resembling Early Crawford; equal to it in flavour and as good a bearer; a very desirable peach; freestone.

Comet.—Ripe, 20th February, 1902, 28th February, 1903; fruit large, round, with a slight point; skin a fine yellow; flesh deep yellow, a little red at stone, juicy and melting, highly vinous; good for canning, &c.; a free bearer; freestone.

Late Crawford.—Ripe, 5th March, 1903; fruit large, roundish; skin deep yellow, mottled with dark red; flesh pale yellow, capital peach for canning, drying, or marketing; good cropper; freestone.

Salwey.—Ripe, 4th March, 1902, 10th March, 1903; fruit medium to large, round; skin yellow, fine red in sun; flesh fine yellow, firm, juicy; splendid canning, drying, or market peach; carries well; heavy cropper; freestone.

Manuring.

The following notes are taken from Farmers' Bulletin No. 17—"Formulæ for Preparing Fertilisers," by Mr. F. B. Guthrie, Chemist of this Department:—

For Stone Fruit.

Peaches, plums, apricots, &c., require rather more liberal manuring than apples and pears. They show more readily want of nitrogen, and this ingredient should be applied in a soluble form. It is also important that it should be applied early in the season. This is the reason why slow-acting nitrogenous manures do not yield such good results, the nitrogen becoming available at a late stage of the crop, and the leaf-growth being increased at the expense of the fruit.

No. 7.

For Stone Fruit.

	Quantity per half-ton.	Cost £	s	d.
Sulphate of ammonia	2 cwt.	1	6	0
Superphosphate	6 cwt.	1	10	0
Sulphate of potash	2 cwt.	1	7	0
	10 cwt.	£4	3	0

This mixtures contains—

Nitrogen . . –	4	per cent.
Phosphoric acid ...	10¼	per cent. (all water-soluble).
Potash .. .. –	14	per cent.

This should be applied at the rate of about 4 lb. to the tree, at a cost of a little under 4d. per tree. For older trees, a larger amount of fertiliser.

Some long-continued and interesting experiments on the manuring of peach-trees were carried out by the New Jersey Experiment Station. A fertiliser of the above composition was applied at the rate of 6 lb. to the tree for a number of years (ten years). The results are compared with those obtained on unmanured land and on land which had received a dressing of 20 tons of farmyard manure to the acre.

The average yield during the ten years was three times that of the unmanured land, and very nearly equal to the yield obtained by the enormous dressing of 20 tons per acre of farmyard manure.

The results obtained in an unfavourable season were even more striking. The yield in a bad year, 1899, which was only 11 baskets of fruit per acre from the unmanured plot, was 152½ baskets from that treated with the chemical manure, and 162½ from the 20 tons of farmyard manure. The farmyard manure contained eight times the quantity of nitrogen, four times as much phosphoric acid, and more than twice as much potash, as the chemical fertiliser.

Picking and Packing the Fruit.

Picking and packing peaches for market is a matter which requires the personal supervision of the grower. The average hired labour cannot be depended upon to pick and pack satisfactorily without strict oversight, for this crop requires more careful attention than many other fruits.

The time to pick peaches depends entirely on the use to which they are to be put. For home or local consumption the fruit need not be picked until quite ripe, but when grown for distant markets fruit should be picked on the green side, as it must reach the consumer in good condition.

The time for picking cannot be determined by the colour alone. The fruit cannot all be harvested at once, but may require as many as four or five pickings, but usually about three. The right time to pick peaches can be best learned by experience.

The natural structure of the peach is such that it does not require to be gathered with the stem on, as is the case with apples. It should be picked carefully, and never tipped from basket to basket, nor bruised in handling.

In packing, the fruit should all be placed in neat, even rows in the cases, and the fruit should be of the same uniform grade.

Drying.

As full directions for drying peaches and other fruits are given in Farmers' Bulletin No. 52—"Fruit-drying"—which will shortly be available, it is not proposed to repeat them here. Growers are recommended to apply to the Department for a copy of that Bulletin. Our warm, dry climate is ideal for the drying of fruit, and in the future we can look for a great extension of this branch of the fruit industry. Fresh fruit has to be sold immediately, irrespective of the ruling market, so that the returns from even the very best grades cannot be uniform, and there is a large element of speculation in the business. When our growers have learnt to can or dry their fruit a great step in advance will have been made, as they will never then be forced to crowd their fruit on a glutted market. The wheat or lucerne grower presses his hay into bales, and waits for the market to suit him. The grazier holds back his wool when prices are low. But the fruit-grower must perforce pack and market his produce as soon as it is ready. Let him learn the principles of canning and drying, and he too will be in a position to regulate his supplies according to the demand.

Marketing.

Great care should be given to the degree of ripeness of each fruit placed in the case. One or two peaches a little further advanced in ripeness than the others sometimes become over-ripe and soft before reaching market; as a result decay sets in, and the general appearance of the case is ruined. Peaches should be packed under rather than over-ripe.

The choicest grades of fruits should never be sent to market in large "gin" cases, but each fruit should be wrapped separately and forwarded in half-cases or bushels, and handled with as much care as eggs if best prices are desired. Of course, when peaches are sent long distances they must necessarily be picked on the green side.

The man who will not grow choice varieties, prefers seedlings, will not properly thin his fruit, will not grade, and who will not try to combat insect and fungous pests, cannot hope to make a success of peach-growing.

In next issure, "Diseases and pests" will be discussed.

(To be continued.)

Inter-pollination of Apples.

In the *Gazette* for November, 1911, page 1001, Mr. Allen, Fruit Expert, gave plans of the orchards of Messrs. Scrivener and Mathews, Mount Irvine, and quoted remarks by these gentlemen and Mr. Morley. Notes were supplied showing how the several varieties of apples are bearing, and the field evidence pointed to the fact that a row of apple-trees will bear best when there is a row of another variety blooming at the same time on the windward side.

Mr. G. W. Commins, Springfield, Wagga, questions the correctness of the theory offered to account for the behaviour of the trees, and supplies some notes from his own observations. His letter was referred to Mr. C. P. Scrivener, who has written a lengthy reply to the arguments used.

The matter is such an important one to planters of orchards that we give the full text of the letters of Messrs. Commins and Scrivener. For more convenient reference, the plans of the two orchards are published again. This Department, and orchardists throughout the State, are indebted to these gentlemen for the information supplied, which will tend to reduce loss occurring through mistakes in laying out blocks of apples and other fruits.

Copy of Letter from Mr. G. W. COMMINS, Springfield, Wagga.

I have read the accounts of Inter-pollination of Apples, in November issue, with interest, but I think other influences are at work, such as shelter from wind. For instance, in Mr. Scrivener's case the trees in the centre, which are most protected, bear best, and those on the outside worst. The Five Crowns should bear worst if the wind theory is correct, because all the right side is exposed, or eleven rows, as against five rows of Jonathan and four of Rome Beauty. Where the Crowns are said to be "light," they have little or no protection, only three rows deep, and while the Crowns against the Jonathans bear well, the Jonathans against the Crowns do not, which upsets the theory, and the trees in the centre, which are most protected, do best. Possibly that part of the orchard may be protected in other ways, such as by higher ground, or tall native trees on the windy side.

The most remarkable instance of cross-fertilisation which has come under my notice happened recently in a Villa Franca lemon tree. I had some trees of that variety, but never had any fruit, so I decided to do away with them. Seeing a heavy-bearing common Lisbon in another garden, I asked for a bit of bud wood, got it, put several buds on one half of one of my trees, leaving one half of the Villa Franca alone, intending to bud that side the next season. The buds grew. I cut away the Villa Franca where they were, and next spring one half of the tree was Villa Franca—which had never had a lemon on—the other half was common Lisbon. All flowered, and to my surprise, the Villa Franca was overcrowded with fruit, and has been so ever since. It bears better than the buds, and is a far nicer lemon, almost seedless and thinner skinned.

About a month ago great destruction was caused in the Wagga district by a biting south-westerly wind. Sufferers said it was frost; I say not so. I found all the shoots on the windy side of the vines black. Those on the sheltered sides were safe. Unprotected tomato plants exposed to the south-westerly wind were killed, but those having the protection of a hedge of sweet peas 6 feet high were unharmed. If the damage had been due to frost all would have suffered alike.

To return to fruit-trees. I find the outside rows on the sides from which the cold winds come, are useless, but the outside rows on the sides from which it rarely ever blows are as good as any other. This shows the necessity for effective breakwinds, and that it is inadvisable to plant an orchard on a slope facing the prevailing cold wind. When giving plans, it is always advisable to indicate the north, so that the influence of the weather may be taken into account; also hills. Then it might appear that the trees on the cold-wind side of the hill carried very little fruit, while those on the sheltered side were good. That often happens in single trees—the side exposed to the cold wind being half killed. It is not so much a question of where the "prevailing" wind comes from, as where the "cold" wind comes from. For instance, the prevailing wind in the Wagga district comes from the west and does no harm; but the cold wind is from the south-west, and kills.

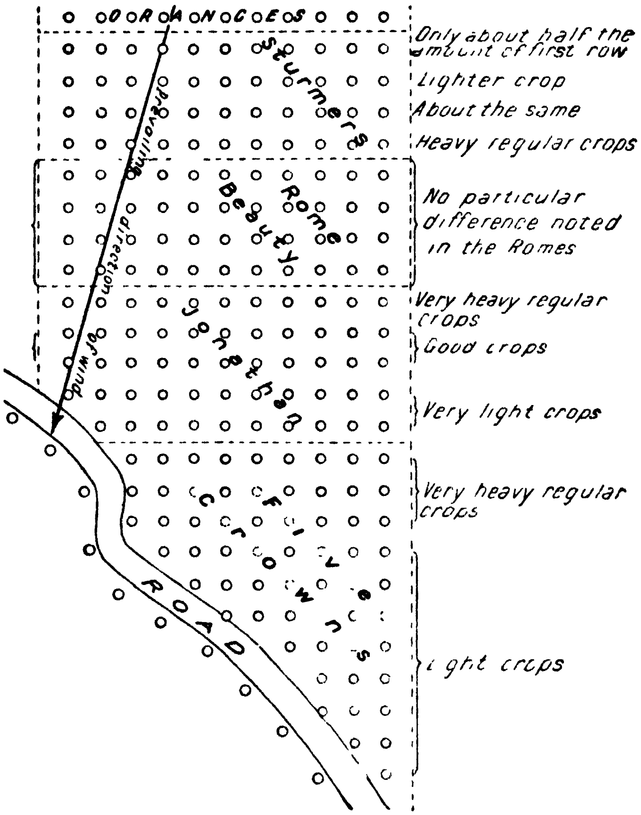
Copy of Reply by Mr. C. P. SCRIVENER, Kookootonga, Mount Irvine, to Mr. Commins' letter.

Firstly, the chief reason why the Jonathans are not affected noticeably by the Five Crowns is because, as suggested, they are on the windward side. Moreover, the Jonathans have, except for the late bloom, finished flowering when the Five Crowns are in full bloom. The pollen from a flower lasts for some days after it has been shed, which no doubt would account to some extent for the Jonathans having such a marked effect upon the Five Crowns.

In the case of the Sturmers, these are affected in spite of the fact that the Jonathans are on the lee side of them. Of course, the Rome Beauties do not affect them, as they flower too late.

The trees being on the inside or outside makes no difference, as the plans clearly show. Take the plan of my place first. The trees run north and south, the top of the page being west, and where the remarks are written at the end of the rows is the north. These rows of heavily fruiting trees run right through the orchard from north to south, fruiting equally well at the exposed north end as on the south side. On the extreme western row of the Sturmers, one tree has always fruited heavily; so much so, in fact, that its growth has been retarded. Near it, in an experimental orchard, is a Winter Pearmain, *which flowers at the same time.*

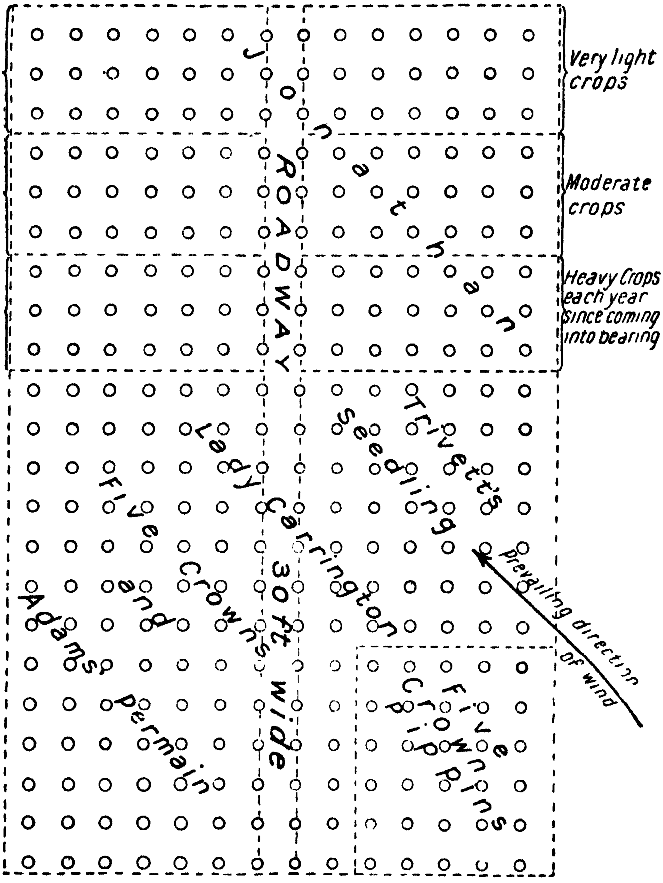
If being protected from cold winds affected the yields of the Five Crowns, those on the extreme east should yield best instead of worst, as they have all the rest of the orchard to protect them from the south-west wind, which with us, as at Wagga, is the coldest wind. In my orchard, going from west to east, the rows fertilised and having the best crops are 4th, 9th, and 14th. If it were a case of shelter, it is strange that this should happen in such a short distance, and that in each instance the trees are of a different variety.



Inter-pollination of Apples.
Plan of Mr. Scrivener's orchard,

Now take Mr. Mathews' orchard; the rows, as in mine, run north and south, the bottom of the page being north, and the side with the writing at the end of the rows being west. It will be noticed that, although the prevailing wind is from about the same direction as at my place, the heavy fruiting rows of Jonathans run east and west, instead of north and south as at my place. Also, the four trees of Jonathans mentioned as fruiting heavily every year are in about the most exposed place in the main orchard. Although not on the extreme west, they have little or no protection from the south-west wind, as the trees westward of them are very small, and through an error the windbreak was destroyed just to the westward of them, making a funnel down which the south-west wind comes with full force. The side where the Jonathans give least fruit is so well protected that no wind ever blows hard on that side.

In Mr. Morley's orchard, there are trees on the extreme outside on the north, south, east and west, which have borne regular heavy crops; but these are odd trees of a different kind, used as "fillers," or just there on trial. They all have trees of a different variety near them, flowering at the same time.



Inter-pollination of Apples.
Plan of Mr. Mathews' orchard.

Our only object in supplying the plans of the orchards was to show that in all the orchards it did not matter in which way the rows ran, and that whether on the north, south, east, or west side of the orchard, or in the middle, the only trees giving regular crops were those nearest to trees of another variety flowering at the same time, or having a fair amount of bloom out when the other variety was in full bloom.

I quite agree with Mr. Commins' remarks respecting breakwinds, and consider that an orchardist who does not protect his orchard is losing money. The orchards here are especially well sheltered.

We have carried out some experiments this season which place the matter of inter-pollination beyond question. Although the season was a bad one for us, on account of the fruit setting badly in all the orchards, except where the trees blooming at the same time were within 50 feet of each other, it was extremely favourable for our experiments.

It is to be clearly understood that I am dealing with varieties flowering at the same time as the Jonathan. The late flowering varieties had better weather conditions. In my orchard the Sturmers and Jonathans flowered splendidly, but failed to set their crop, which I put down to cold, moist conditions, with no wind during the blooming period.

To make my Sturmers set better, I have worked a couple of small limbs of every tree with Jonathan. When doing so, I kept a quantity of the wood cut off, and placed it in water, keeping it there till it came out in bloom. When it flowered, I placed some of the bloom in half kerosene tins filled with water, and these tins were hung in Jonathan trees. Two trees, widely separated from each other, had bloom hung in them. Both the trees so treated set their fruit freely all around where the bloom was hung, these being the only two trees in all my Jonathans which show fruit freely.

The balance of the bloom was placed in a tub, and put in the centre of a square of trees, to see if the pollen would be carried from it to the surrounding trees by bees, it being too low down to be likely to be blown there by the wind. The surrounding trees showed absolutely no result, the bees failing to carry the pollen. The trees treated were those which have up to the present borne only very light crops.

Mr. Morley hung small bits of bloom in some of his Five Crowns which have never yet borne any fruit; and just about where the different bloom was hung there is fruit showing, although there is no fruit on any other part of the tree.

I have also nine pears, supplied to me as Beurre Diel. Although these are large trees, and have flowered well, they have never borne more than a few fruits per tree. This season I took some bloom from another variety growing at some distance from these pears, placed it in water, and hung it on one of the pear-trees. Where this bloom was hung the tree shows fruit freely, the surrounding trees, as usual, having only odd fruits here and there.

In Messrs. Mathews and Morley's orchards, the Jonathans with a different variety alongside in the next rows have crops, although not so heavy as usual. The trees two rows away have no fruit to speak of.

There are other instances in each orchard mentioned which I could quote in support of the inter-pollination idea, but I think the above should be enough. All these things can be shown to any person who visits any of the orchards; and as we, through not knowing this in time, are only getting the full use of less than half our orchards, we should like to make the facts public, so that others may not make the mistake of planting apple and pear trees in blocks, especially in cool, damp climates like ours.

I was very glad to see Mr. Commins' remarks about the inter pollination of the lemons, as, although I have no evidence on this point myself, I was taking no risk, and have mixed my varieties of oranges.

I believe the value of bees in pollination is very much overrated. When my Sturmers and Jonathans were in splendid flower there were bees in plenty, but still the trees failed to set their crop. Bees are out to get pollen. That they do in some instances carry pollen from tree to tree is luck; but it is quite unthinkable that they would make it their business to go round and select different varieties alternately. To get a load, a bee only visits about eighty to one hundred flowers, and if the trees are in full bloom it never travels far.

I am indebted to Mr. H. B. Morley for his help and advice on this subject.

SPRAYING PEACH-TREES FOR SHOT-HOLE FUNGUS (*Phyllosticta circumsissa*).

MR. F. CHILTON recently forwarded specimens of peach leaves affected by this disease, from both sprayed and unsprayed trees. The spray used was Bordeaux mixture, 6–4–50 formula, and the sprayed trees were worse than those untreated.

Mr. G. P. Darnell-Smith, Assistant Microbiologist, Bureau of Microbiology, reports that the cause may be either:—

(1) The sprayed leaves had a larger number of spores in the beginning;
(2) The spores may have penetrated the tissues of the leaf before the spray was applied; or
(3) The vitality of the leaves may have been lowered by the application of too strong a spray.

Mr. Chilton replies that the peach-trees were of the same variety, and the rows adjoining each other, and the treatment as regards cultivation, pruning, etc., exactly identical. He thinks the trouble was caused by the spray being too strong.

The application of Bordeaux mixture and its uses are at present being investigated by the Bureau of Microbiology. Mr. Chilton is carrying out trials of several other fungicides against fruit diseases, and has kindly promised to report to the Department the results obtained.

Fruit-flies and other Insects attacking Cultivated and Wild Fruits in New South Wales.

W. B. GURNEY, F.E.S., Assistant Government Entomologist.

PART III.

PARTS I and II of these notes appeared in the *Agricultural Gazette* for May, 1910, and August, 1911, respectively, and dealt with the Mediterranean Fruit-fly (*Ceritítis capitata*) and Queensland Fruit-fly (*Dacus Tryoni*). This Part is concerned with the third common fruit-fly of our orchards, viz., the so-called Island Fly. It also deals with the Tomato Fly, which sometimes attacks citrus fruit; the Ferment Fly, which attacks all classes of damaged fruit; and the two common fruit-eating beetles of the genus *Carpophilus* (Fam. *Nitidulidæ*). An important feature of this Part is the presentation of figures of the maggots, and the details of their structure, of all the above species, as a guide to fruit-growers and fruit inspectors in determining with a lens which of these maggots they may have in their fruit at any time.

The Island Fruit-fly.

(*Trypeta musæ*).

In New South Wales this species generally attacks—

Orchard fruits.—Oranges, mandarins, lemons, peaches, &c.; occasionally apples, pears, and quinces.

Wild fruits.—Black apple or native plum (*Sideroxylon australe*).

This species I have shown to be a native of the coastal districts of New South Wales from the Illawarra district (Bulli) north to the Tweed River, and it ranges into Queensland. The name "Island Fly" is, therefore, misleading.

It is a yellow-bodied fly, with the tip of the abdomen black. The wings are of large expanse, and strikingly mottled with dark-brown blotches. While crawling over the fruit and leaves the wings are held in a characteristic manner—horizontally, almost at right angles with the body, but irregularly, one being now disposed at right angles while the other is held at an angle of 45 degrees. The wings are also alternately raised and depressed, suggesting flag-signalling.

The female has a pointed abdomen, from which a pointed ovipositor can be protruded. The male abdomen is blunter at the tip.

On citrus trees the flies are fond of secreting themselves deep within the foliage, and by going underneath and looking up into the branches one may often see several flies crawling about on the inner leaves and fruit, though none would be visible looking at the trees on the outside. Even through the cold winter months of June and July, Island flies may be seen thus hidden in the trees.

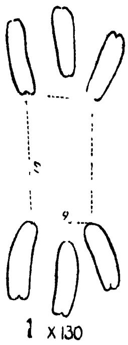


Fig. 1.

Diagram of posterior spiracles of maggot and pupa of Mediterranean Fruit-fly.

Drawn in relative positions as indicated by units 6 and 10 in the figure. Compare with Figs. 2 and 3, which are drawn to the same scale.

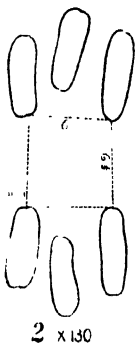


Fig. 2.

Diagram of posterior spiracles of maggot and pupa of Queensland Fruit-fly.

Compare with Figs 1 and 3.

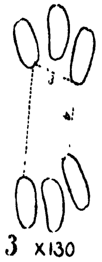
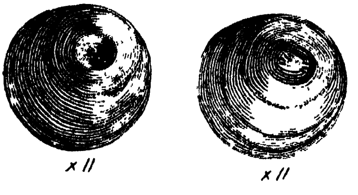


Fig. 3.

Diagram of posterior spiracles of maggot and pupa of Island Fruit-fly.

Compare with Figs. 1 and 2.

Though sound fruit seems to be sometimes attacked, thorn-pricked citrus fruit and fruit which has fallen into prongs of the branches are favourite places in which the flies deposit their eggs. They lay their eggs also in fruit infested with other fruit-fly maggots, in cracked, bruised, or fermenting fruit, and even in apples and pears which have been bored by codling moth grubs.



Island Fly pupa (*Trypeta musæ*). Posterior end showing spiracles closer together and sunk in a small depression.

Mediterranean Fly pupa (*C. capitata*). Posterior end showing spiracles wider apart and flush with surface, not sunk in a depression.

Fig. 4.

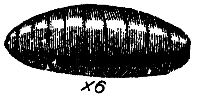


Fig. 5.

Pupa of Island Fruit-fly.

Pointed extremities. Compare with Fig. 6.

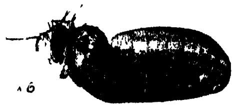


Fig. 6.

Pupa of Mediterranean Fruit-fly.

Showing adult fly just emerging.

Times occupied in Development.

Egg Stage.—A few days.

Larval Stage.—Two to four weeks; in cool weather, or under unusual conditions, may be several weeks longer.

Pupal Stage.—Ten days to four weeks.

Adult Life.—In captivity, from a few weeks up to six and ten weeks. Probably as long when free.

From hatching of egg to winged state, six to ten weeks recorded

Eggs and Maggots.

The eggs are minute, white, glistening cylinders, in loose patches, in or near cracks or abrasions of the fruit. The shells of the hatched eggs show up of a whiter shade. They are not generally seen without using a lens, and examination shows a more reticulate shell than in the case of the Mediterranean fly eggs.

The larvæ are somewhat more slender, and the development is slower, than is the case with the maggots of the other two fruit-flies of our orchards; and development may be retarded in the colder months of April, May, and June.

The maggots prefer the softer and rotten portions of the fruit attacked, and both in their maggot and pupal stages prefer moister surroundings than the other two fruit-flies of our orchards. The posterior spiracles are small and close together individually (see Plate), and when they pupate these spiracles are situated in a small depression at the posterior end of the pupa. In Mediterranean and Queensland fruit-fly maggots the posterior spiracles are larger and wider apart individually, and in the pupæ are flush with the surface, not sunk in a pit as in the Island fly pupæ (see Figs. 1, 2, 3, and 4, and Plate I). The diagrams are drawn at the same magnification, and show the posterior spiracles in relative position as they appear through the lens.

Pupa.

The maggots work 1 or 2 inches down into the soil and pupate. The pupa is of a dark reddish brown, and is darker in colour than the Mediterranean or Queensland fly pupæ. It is also narrower in girth and more pointed at the extremities, while there is a characteristic small pit at one extremity containing the posterior spiracles (see Figs. 4 and 5).

Damage caused by Maggots.

Although occasionally marketable fruits are affected, they chiefly infest already damaged or unmarketable fruit, and it is to be noted this fly is not to be dreaded like the Mediterranean and Queensland flies, which habitually puncture and deposit their eggs in sound fruit.

IDENTIFICATION OF FLY MAGGOTS.

The following notes are designed to show how fruit inspectors and growers may determine the different Fruit-fly maggots, as well as the "Tomato" and "Ferment" fly maggots, from each other, and know the pest they have in their fruit:—

With a little practical work with the lens one can tell the Tomato and Ferment fly maggots from the true Fruit-fly maggots, but it requires more care and practice to be able to say, by examining the maggot, which is an "Island" fly maggot and which are "Mediterranean" or "Queensland" fly maggots. However, for practical field and market inspection purposes, it is necessary to be able to distinguish "Tomato," "Ferment," and "Island" maggots from each other and from the "Mediterranean" and "Queensland" fly maggots.

It is necessary to read the description of Plates I and II, and also descriptions under the illustrations of the various larvæ and pupæ, to follow the similarity and distinctive differences of the various larvæ.

PLATE I.

A. 1. Diagram of maggot of Mediterranean fruit-fly (*Ceratitis*); dorsal view, showing (*a*) anterior spiracles behind small head; (*b*) main lateral trachea (air or breathing tube) passing from anterior spiracle to the corresponding posterior spiracle plate at (*c*).

2. Jaws and chitinous support.

3. Magnified view of one of the two anterior clusters of spiracles, seen at (1*a*). It consists of a chitinous plate, with a row of chitinous tubercles, which project at the surface, and each have an opening at the tip, through which air passes into the common lateral tracheal tube. (Nine to fourteen tubercles are visible in different mounts.)

4. Magnified view of posterior clusters of spiracles indicated at (1*c*). Each posterior cluster consists of three spiracles on a chitinous plate. Each spiracle shows numerous irregular internal partitions, and the spiracle possibly closes together somewhat along a longitudinal axis, the hinges being at the notch or kink at each end of the spiracle About the spiracles are bunches of broad, flat hairs, some of which are branched. It is possible these hairs fold across the spiracles and aid in preventing the ingress of juice to the breathing tubes (trachea) when the maggots are immersed in the fruit juice.

NOTE.—To indicate the relationship and differences of the jaws and spiracles of the three fruit-fly maggots they are drawn on the plate at the same magnification, and in the case of the posterior spiracles the two sets of three are drawn at their relative distances from each other, as also the individual spiracles of each set from each other.

B and C. [See description on Plate itself.]

PLATE II.

A. Mediterranean Maggot (*Ceratitis*); side view.

B. Tomato-fly Maggot (*Lonchæa splendida*), with details.

C. Ferment-fly Maggot (*Drosophila*), with details.

TOMATO-FLY.

(*Lonchæa splendida*).

The maggot of this small metallic green fly, so commonly destructive to ripe tomatoes, and occasionally also to oranges, very clearly resembles the maggots of the true fruit-flies. Examine the figure of this Tomato-fly maggot (Plate II), and it will be seen by the lens that the posterior spiracles are situated on minute chitinous tubercles; and, moreover, the three spiracles on each tubercle, instead of being comparatively parallel to each other as in the fruit-fly maggots (see Plate I, A, B, and C), are placed point to point and almost at right angles to each other. These differences will at once determine the Tomato-fly maggots. Again, under the microscope, it will be seen that the comb-like anterior spiracle plate bears only six tubercles (see Plate II, Fig. B 4), whereas nine to twelve or fourteen are usual in the fruit-flies. The jaws are shown on Plate II, Fig. B 2.

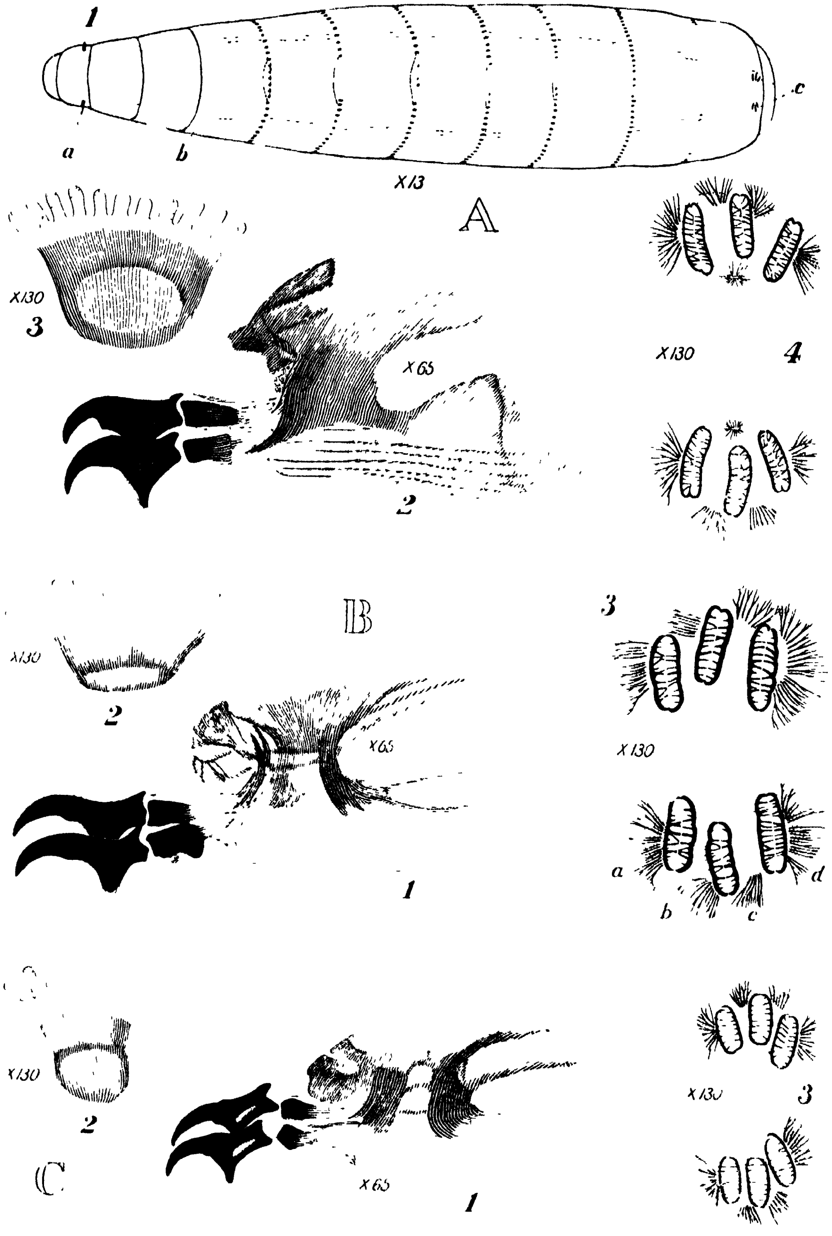


PLATE I.

A Maggot of Mediterranean Fruit-fly (*Ceratitis capitata*) (Dorsal view).

1. Diagram of larva, showing (*a*) anterior spiracle; (*b*) tracheal tube; (*c*) posterior spiracles. 2 Jaws, enlarged. 3 Anterior spiracle, enlarged. 4. Posterior spiracles and hairs, enlarged.

B—Details of Maggot of Queensland Fruit-fly (*Dacus Tryoni*).

1. Jaws. 2. Anterior spiracle. 3. Posterior spiracles.

C—Details of Maggot of Island Fruit fly (*Trypeta musa*).

1. Jaws. 2. Anterior spiracle 3. Posterior spiracles.

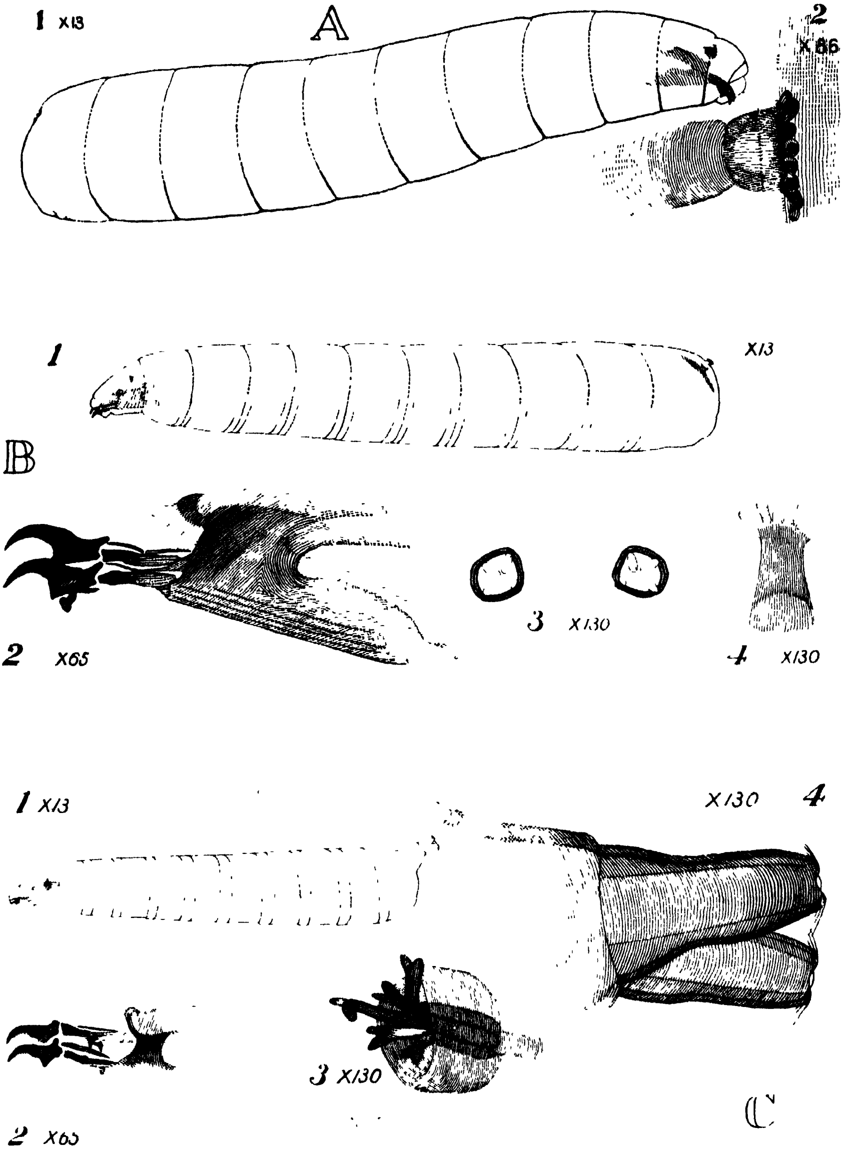


PLATE II.

A—1 Maggot of Mediterranean Fruit-fly (*Ceratitis capitata*). [Side view.]
2. Anterior spiracle (enlarged) showing tubercles projecting above skin.

B—1 Maggot of Tomato Fly (*Lonchæa splendida*).
2. Jaws. 3. Posterior spiracles (each cluster of three radiating almost at right angles to each other). 4. Anterior spiracle.

C—1. Maggot of Ferment Fly (*Drosophila*).
2. Jaws (with serrated ventral edges). 3. Anterior spiracle.
4. Posterior processes, bearing spiracles and bristles at their extremities.

FERMENT-FLY.

(*Drosophila*).

Probably the two most common species are *D. obscura*, and *D. melanogaster*. They are tiny dusky yellowish flies, with reddish eyes, and are attracted by all classes of fermenting or damaged fruit or fruit juice, on which they lay their eggs. The maggots very quickly hatch and commence feeding. They are plentiful throughout the orchards, fruit markets, fruit shops, jam factories, wharves, and wherever their food is available, and are sometimes known as "Wine Flies," as grapes and grape juice attract them. It is to be noted they do not puncture fruit, but essentially require damaged or fermenting fruit, and are, therefore, scavenger flies and not pests as are the fruit-flies, though the maggots are often confused. Examine Plate II, Fig. C, and the maggot is seen to be much smaller than the full-grown Fruit-fly maggot, or even the Tomato-fly maggot: but the main distinguishing character is the bilobed protuberance at the posterior end, bearing the posterior spiracles at the tip of each process, and fringed by a few bristles. This tubercle is retractile. The anterior spiracle, as the lens will show, differs markedly from all the other maggots mentioned. See Plate II, Fig. C 3, from which it will be seen that each anterior spiracle cluster consists of five chitinous rods or tubercles, some curved, projecting from behind and above the jaws. The jaws, in general, are similar to those of the other maggots but, under the microscope, each jaw is finely serrated or toothed along its curved ventral edge.

FRUIT-EATING BEETLES.

(*Carpophilus*; Fam. *Nitidulidæ*).

The grubs of the fruit-eating beetles are whitish and minute, about $\frac{1}{5}$ of an inch in length. They are common in decaying, or moth or fly-infested, fruit of all descriptions, and are frequently taken to be fly maggots. Throughout Australia, oranges, mandarins, lemons, apples, pears, quinces, peaches, &c are all commonly infested when damaged in any way, and I have found them

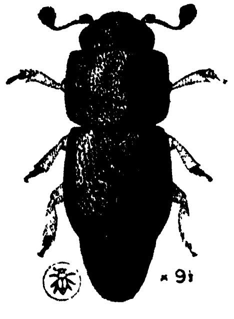


Fig. 7.
Brown Fruit-beetle
Carpophilus pilipennis).

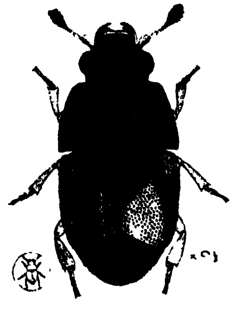


Fig. 8.
Black Fruit-beetle
(*Carpophilus aterrimus*)

also in the native Black Apple (*Sideroxylon*) in the scrubs of New South Wales.

The eggs are laid on their food, and dozens of the resulting grubs, and also the adult beetles, may be found in a single fruit, sometimes along with fruit-fly and ferment-fly maggots, sometimes in codling moth grub bores.

There are two common species in New South Wales, both small flat beetles, only about $\frac{1}{8}$ inch long, with short wing-covers (elytra). One species (*Carpophilus pilipennis*, see Fig. 7), is of a reddish-brown colour while the other species (*C. aterrimus*) is of similar size and shape, but is black, with two irregular yellowish patches, one on each wing cover (see Fig. 8). The grub is shown in Fig. 9, and is at once seen to be different from a fruit-fly or any fly maggot. It possesses six little legs on the lower surface behind the head, while the hind end of the body is bifurcate, there being a pair of blunt projections there. The spiracles are arranged entirely differently from those of fly maggots, being, in this case, situated along the sides of the body (8 pairs), see Fig. 9. There should be no difficulty in distinguishing, by aid of a lens, these comparatively harmless beetle grubs from fly maggots.

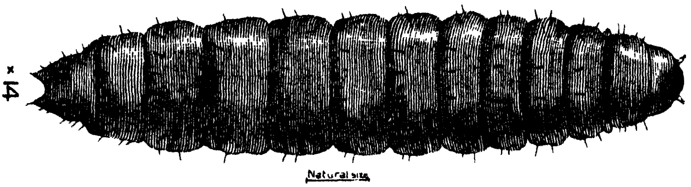


Fig. 9.—Grub of Brown Fruit-beetle, which feeds in fruit.

The Hand-winch Stump and Tree Puller.

Trials were recently conducted with this machine at Grafton Experiment Farm. The machine has a small winding-drum, about a foot in diameter, worked with an 8-feet lever, pulled by two men. A grab handily disposes of slack rope, and a snatch-block doubles the direct drum-power, making it equal to 24 tons. The power is transmitted to a flexible wire rope, one end of which is anchored to the butt of a standing tree, and the other looped around the tree to be pulled, about 10 feet from the ground.

A swamp mahogany tree, 2 feet 9 inches in diameter, was pulled out by the roots in twenty-two minutes from the time of getting on full strain. About a ton of earth came away with the roots, and from the bottom of the hole to the top of the roots and soil piled up was a distance of some 10 feet, whilst two lateral roots were 15 and 13 feet long respectively.

Mr. A. H. Haywood, Manager of the Farm, recommends farmers who have much tree-pulling to do, to give this machine a trial. It is sold by Messrs. Trewhella Bros., 11 Macquarie-place, Sydney, and the price is £19 5s.

Average Monthly Rainfall Table.

The following figures, supplied by the Commonwealth Meteorological Bureau, show the average rainfall for each month of the year, as far back as the monthly records go, at 107 stations in New South Wales. Stations have been selected as typical of their districts as practicable, and so placed that an approximate estimate of the rainfall at intervening points may be obtained by comparison with surrounding stations for which figures are given. The rainfall is in points (100 = 1 inch).

Stations.	Years.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total inches.
NORTH COAST.														
Byron Bay	17	836	1085	1043	615	808	585	439	516	333	394	496	705	78·55
Lismore	25	601	761	773	453	459	325	396	295	279	258	363	462	54·25
Casino	36	534	634	608	408	293	238	253	226	212	279	336	397	44·18
Grafton	40	502	495	494	357	259	242	217	178	191	254	298	363	38·50
Woolgoolga	23	616	799	908	575	481	462	382	434	276	382	365	601	62·81
Kempsey	28	444	556	540	372	336	344	301	332	238	272	334	416	44·85
HUNTER AND MANNING.														
Port Macquarie ..	39	587	755	631	600	578	477	437	385	415	325	414	605	62·09
Taree	27	400	650	480	400	284	329	340	315	212	244	315	467	44·36
Gloucester	19	419	460	550	308	260	257	325	268	229	310	333	465	41·84
Dungog	22	395	491	525	352	268	306	319	310	245	290	334	395	42·30
Raymond Terrace ..	12	231	297	369	340	296	241	385	439	332	313	237	253	37·33
Newcastle	48	350	460	546	442	483	417	444	342	326	298	287	323	47·18
West Maitland ..	42	323	364	394	272	245	252	267	242	266	227	242	284	33·78
Singleton	29	258	324	338	231	174	226	218	204	205	218	247	275	29·18
Muswellbrook ..	39	218	252	216	163	161	206	168	175	163	177	202	285	23·86
Murrurundi	38	267	304	258	219	212	303	226	271	246	271	270	322	31·69
METROPOLITAN.														
Sydney	51	341	477	509	532	505	531	454	327	292	284	299	248	47·99
Parramatta	51	328	395	373	374	285	324	315	248	223	226	233	269	35·94
Penrith	13	179	248	234	230	190	190	336	268	139	156	189	246	26·05
Richmond	25	342	265	378	255	272	261	233	189	210	220	233	289	31·47
Windsor	47	283	352	349	272	282	300	222	177	191	196	238	226	30·88
Camden	25	322	225	296	223	184	265	242	208	146	171	195	251	27·28
SOUTH COAST.														
Picton	30	321	262	335	279	194	246	216	196	179	222	191	267	29·08
Wollongong	36	404	494	414	492	386	459	326	277	277	277	269	290	43·65
Kiama..	24	464	484	618	472	414	524	435	385	308	278	304	388	50·74
Berry	19	630	532	701	604	460	671	536	424	366	331	359	448	60·57
Nowra	26	385	309	395	295	285	462	346	296	199	233	229	281	37·13
Milton	23	330	428	417	452	450	359	447	291	309	360	304	337	44·84
Braidwood	33	269	264	216	229	212	256	181	216	195	232	208	218	26·91
Bodalla	34	342	413	407	287	273	320	225	256	282	285	260	262	36·12
Bega	29	289	312	326	253	275	354	204	260	198	262	199	268	32·00
Eden	38	314	326	320	293	347	360	239	227	230	285	243	252	34·36
Moss Vale	38	342	364	373	330	366	382	357	273	235	311	271	247	38·51
NORTHERN TABLELAND.														
Tenterfield	39	455	321	333	183	179	218	228	188	240	257	337	374	33·13
Glen Innes	28	431	314	295	187	182	240	179	203	220	309	336	357	32·51
Inverell	35	357	289	312	210	186	230	193	207	217	259	249	312	30·21
Armidale	47	362	345	298	201	177	267	193	202	223	275	333	356	32·32
Walcha	24	324	289	292	198	171	263	170	197	234	259	312	343	30·51
CENTRAL TABLELAND.														
Coolah..	25	276	271	256	178	195	236	187	240	202	212	225	286	27·64
Gulgong	38	246	262	228	139	176	196	152	187	185	176	202	238	23·86
Mudgee	39	221	233	196	201	210	250	180	208	230	231	201	241	26·02
Orange	40	278	275	276	237	315	436	304	339	322	319	277	255	36·27
Blayney	24	302	185	233	212	201	321	267	298	264	265	183	237	29·63
Bathurst	51	249	220	202	174	176	194	159	166	188	210	212	189	23·39

Average Monthly Rainfall Table—*continued.*

Stations.	Years.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total inches.
SOUTHERN TABLELAND.														
Crookwell	26	287	183	226	220	212	422	299	322	303	278	195	232	31·79
Goulburn	46	266	247	201	164	175	205	159	182	201	212	202	199	24·13
Yass	29	224	124	161	180	175	268	189	214	198	221	171	169	22·94
Queanbeyan	39	236	183	190	169	170	196	131	158	177	225	216	196	22·47
Kiandra	37	408	310	404	458	527	868	625	594	667	676	489	366	63·92
Adaminaby	20	238	195	243	198	175	345	221	201	271	289	225	229	28·30
Cooma	45	201	219	177	138	123	149	118	95	160	181	188	158	19·07
Delegate	20	218	199	229	207	184	291	224	178	211	248	175	223	25·87
Bombala	25	240	171	197	149	137	268	176	164	162	196	177	237	22·74
NORTH WESTERN SLOPE.														
Warialda	32	315	335	300	176	185	208	159	187	214	225	230	273	28·67
Bingara	30	319	344	317	200	220	221	184	217	211	266	256	308	30·63
Narrabri	40	280	308	276	177	210	215	170	179	178	185	232	215	26·25
Boggabri	25	208	262	269	126	163	197	139	200	153	178	201	238	23·34
Gunnedah	32	228	254	279	170	180	171	149	210	186	204	209	258	24·98
Quirindi	27	268	264	266	186	200	228	155	210	206	218	243	318	27·62
Tamworth	34	266	260	217	199	186	226	171	212	215	231	270	279	27·32
CENTRAL WESTERN SLOPE.														
Coonabarabran	30	274	356	311	267	248	234	188	256	210	217	212	251	30·28
Gilgandra	24	251	181	231	254	203	205	196	202	163	174	189	240	24·98
Dubbo	38	197	192	183	192	194	200	155	186	192	158	182	199	22·30
Wellington	28	196	172	178	188	184	198	161	211	178	195	199	238	22·98
Molong	25	274	189	261	283	233	285	207	257	240	234	200	277	28·90
Parkes	19	228	140	230	176	187	205	177	178	196	172	126	151	21·66
Forbes	34	165	172	203	178	176	176	148	174	220	189	134	154	20·88
Grenfell	24	210	196	203	201	188	275	213	217	221	207	140	190	24·61
SOUTH WESTERN SLOPE.														
Young	39	194	171	190	208	210	303	225	228	234	234	169	181	25·47
Burrowa	28	202	130	166	190	168	234	174	197	181	201	147	181	21·71
Cootamundra	25	238	136	173	202	165	263	199	210	182	217	144	173	23·02
Junee	27	149	122	173	162	165	240	171	184	189	198	145	138	20·36
Wagga	37	148	140	179	178	195	278	183	199	183	215	162	128	21 88
Germanton	24	184	140	197	213	228	381	288	260	229	234	199	183	27 36
Albury	46	146	168	207	226	253	351	271	283	257	281	195	159	27.97
Tumbarumba	25	276	187	306	270	290	551	387	384	364	378	201	263	39.17
Tumut	24	245	144	247	246	243	435	299	299	288	290	205	212	31 53
Gundagai	17	145	95	198	215	178	302	205	223	190	224	141	172	22 88
NORTH WESTERN PLAIN.														
Mungindi	23	251	307	259	151	130	154	100	127	129	147	147	176	20·78
Moree	31	268	321	266	142	172	181	131	152	167	191	195	193	23 79
Walgett	31	211	244	176	147	164	144	108	142	120	135	160	146	18 97
Wee Waa	26	276	266	271	166	188	201	160	181	154	173	185	191	24 13
Pilliga	27	234	240	180	144	189	168	133	161	136	148	147	177	20 52
Baradine	25	228	249	205	205	244	213	178	194	146	172	173	177	23·84
CENTRAL WESTERN PLAIN.														
Coonamble	32	181	224	207	177	155	145	116	144	149	152	150	157	19·57
Nyngan	28	204	228	189	161	143	110	108	151	101	97	123	148	17·63
Warren	24	181	182	190	178	134	135	113	165	107	112	130	159	17·86
Trangie	24	206	179	219	182	167	171	153	179	144	150	152	145	20·47
Narromine	17	195	154	191	190	134	164	147	193	122	130	141	122	18·83
Dandaloo	21	241	189	229	211	163	151	148	162	144	151	132	158	20·79
Trundle	10	113	101	163	234	103	98	131	146	143	118	97	131	15·78
Condobolin	29	183	137	156	153	148	150	124	161	128	152	111	144	17·47
Wyalong	28	156	107	142	150	147	196	149	171	155	182	137	125	18·17
RIVERINA.														
Cudgellico	28	153	111	117	123	136	150	111	138	139	132	104	139	15·53
Hillston	23	106	89	123	117	145	153	115	141	114	135	93	71	14·02
Narrandera	25	136	112	147	149	147	202	151	165	138	172	117	90	17·26
Urana	39	95	129	154	141	176	220	130	150	140	159	119	99	17·12
Deniliquin	50	98	106	146	156	161	175	125	144	159	157	114	83	16·24
Corowa	27	135	124	170	161	183	261	186	203	179	187	141	141	20·72
Moulamein	22	70	73	94	127	136	177	107	135	109	108	101	91	13·28
Jerilderie	21	94	85	122	141	151	188	120	170	116	134	122	101	15·43
WESTERN DIVISION.														
Cobar	29	155	140	113	132	123	123	85	127	97	119	116	122	14·52
Bourke	38	197	183	156	133	104	108	87	94	92	107	127	116	15·04
Wilcannia	31	101	70	115	75	104	98	57	86	73	95	57	78	10·04
Wentworth	39	85	63	77	88	121	125	89	107	104	97	95	95	11·46
Brewarrina	36	229	190	185	131	107	157	95	104	138	110	119	95	16·60
Angledool	20	209	218	169	101	116	138	85	103	123	119	91	167	16·34

Orchard Notes.

W. J. ALLEN.

JANUARY.

DURING the last month good soaking rains have fallen throughout the greater portion of our fruit-growing districts, and trees and vines are in splendid condition, and the promise for a good crop is very bright.

Cultivation.

Should rain fall during the month the soil should receive a thorough cultivation immediately it is dry enough, and all young trees would benefit by having the soil which may have been missed by the cultivator well loosened up. Where any weeds have made their appearance in the orchard the soil should be well stirred up with the cultivator—as all weeds, summer grass, &c., tend to rob the ground of the moisture which at this time of the year is so badly needed for the trees and vines.

Irrigation.

Wherever water is available to irrigate fruit-trees or vines, it is more than likely that they will require a thorough soaking this month. See that the water is confined to furrows, and be careful not to allow it to flood over any portion of the land; also, that the best use is made of such water, and that none of it is allowed to run to waste.

After the soil has been well soaked, and as soon as the land is sufficiently dry to work, give it two deep cultivations in order to bring it to a proper state of tilth. Also see that all vines and trees are well worked around with a fork-hoe while the soil is still damp. This will keep the ground from baking and prevent excessive evaporation.

Codling Moth.

See that all bandages are given careful and regular attention, and that all infested fruit is picked from the trees and ground, and destroyed by boiling or burning, in accordance with the regulations under the Fruit Pests Act. Give final spraying with arsenate of lead.

San José Scale.

Wherever it is found that trees are affected with this scale, they should receive a thorough spraying, as soon as the crop is harvested, with the special resin wash. Leaflets can be had on application to the Department of Agriculture.

Prune-trees affected with this scale at Wagga have been successfully fumigated in the early part of November without damaging either leaves or fruit; the work, however, was performed during the coolest part of the day, and the dose used was a little heavier than that shown in No. 2 Table for citrus trees. [See Departmental Leaflet No. 663, obtainable on application to the Under Secretary, Department of Agriculture.]

Red, Brown, and Indian Wax Scale on Citrus Trees.

Trees may be either fumigated or sprayed for the destruction of scale insects. This work may be commenced this month provided the trees are in good strong condition; but, as this is usually a very hot month, the work will have to be done on cool days or at night, but never fumigate during the heat of the day at this time of the year.

Summer Pruning.

Wherever young apple, pear, or apricot trees are found to have too much growth throughout the centre of the trees they should be thinned out, cutting back the superfluous growth to within about 3 inches of the main limbs or spurs from which they spring. This will open up the tree so as to admit light and air, which are both necessary for the proper development and ripening of wood, as well as assisting the tree in its efforts to develop fruit spurs.

In some orchards in the tableland districts, where the younger trees are not well protected from heavy windstorms, it is advisable to pinch back the leaders, so as to check the rapid upward flow of sap. By doing this the wood will be caused to ripen better, and there is the greater protection against the wind.

Re-working Old Trees.

The latter part of this month is the best time to bud to better varieties all poor or worthless varieties of fruit-trees found growing in the orchard. Be sure that the buds to be used are taken from trees which have borne fruit of the very best quality. Insert them on the outer or underneath side of the limbs, where it will be found that the bark usually raises more easily than on the upper side, and where they are more apt to form a well-shaped tree than if the buds have been inserted on the upper or inner side of such limbs. [*See* Miscellaneous Publication 1,396.]

Vines.

See that no suckers are allowed to remain on the vine, and in coastal districts it will be found advisable to top them when they are putting on strong growth.

Preparing for Cover Crops.

Do not forget to order black tares, peas, rape, rye seed, or whatever crop it is intended to sow for green manure between the trees. The seed should be ordered toward the end of this month, so that it will be on hand when required.

Marketing Fruit.

See that any fruit intended for market is not allowed to become too ripe before being picked, else by the time it reaches the consumer it will be in an over-ripe condition. Grade all fruit evenly and pack it neatly and securely, so that it will present a good appearance when put before prospective buyers.

Brown Fruit Rot.

This fungus disease has shown up earlier this season, and in a more virulent form than for many years. I cannot too strongly impress upon the fruit-growers the very great necessity for regularly and thoroughly picking up all infected fruit and destroying same. In orchards where the lime-sulphur spray has been used regularly every winter, it has been found that the attack of this fungus is not nearly so bad.

At the Hawkesbury Agricultural College orchard where the lime-sulphur spray is used every winter, there are many varieties of peaches and nectarines, and we have found not 2 per cent. of the crop affected with Brown Fruit Rot this season. Stone-fruit orchards planted not 1½ misle away are badly infected with this fungus.

Mixing Lime-sulphur and Arsenate of Lead.

The Vreeland Chemical Company, New York City, supply the following information *re* the mixing of lime-sulphur and arsenate of lead:—

> In combining the lime-sulphur and arsenate of lead, the following method should be adopted:—The required amount of lime-sulphur should be added to each 50 gallons of water. The dry-powdered arsenate of lead should then be thinned to about the consistency of rich milk, but should not be added to the 60 gallons of water and lime-sulphur until just before the grower is ready to start spraying operations—that is, the two materials should not stand mixed any longer than necessary, and, moreover, the arsenate of lead should always be added last. The reason for this is that there is a slight chemical change between the two materials, as will be very readily noticed by the fact that the lime-sulphur carries a cherry colour, but when the two materials are mixed there is a grayish drab colour.

COLD STORAGE OF APPLES FROM BATHURST EXPERIMENT FARM.

At the request of the Fruit and Vegetable Growers' Union of New South Wales, five cases of apples from Bathurst Experiment Farm were placed in Messrs. Birt & Co.'s cold store on 3rd May, 1911, to test their keeping qualities. The varieties were Rome Beauty, Granny Smith, Stone Pippin, Yates, and Buncombe.

On 20th July, 1911, the fruit was examined by an officer of the Department, and found to be in first class condition.

On 16th September, the Rome Beauties were commencing to wilt a little; the Granny Smiths and Stone Pippins were keeping splendidly; the Yates and the Buncombes were shrivelling a good deal. The Yates were of small size and the Buncomes of poor quality. The Rome Beauties, Yates, and Buncombes were then sold, realising 5s., 4s. 6d., and 3s. per case respectively.

On 31st October the Granny Smiths were shrivelling a little, and some of the fruit showing signs of scald. The Stone Pippins were also shrivelling a little, and some going off. These two cases were therefore sold, after being in cold store for six months. The case of Stone Pippins brought 9s., and the Granny Smiths 10s.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Bathurst	Mr. S. McKibbin, O'Connell.
Bonville	Mr. H. B. Faviell, Bonville.
Cardiff	Mr. D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coreen-Burraja	Mr. H. Vickers, Coreen.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gunning	Mr. E. H. Turner, Gunning.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. T. Glasgow, Kellyville.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Lawrence	Mr. E. T. Cooney, Lawrence.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, Penrose.
St. Mary's	Mr. W. Morris, Queen and Victoria sts., St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. T. Collins, jun., Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. S. Mann, Good Hope, Yass.

OBJECTS.

The objects of the Bureau are to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

The Government will subsidise the branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements. Regular monthly meetings should be held, and arrangements made for papers to be read at the meetings by members on various points of local or general interest in connection with agriculture, and these papers should be fully discussed. Whenever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

General Notes.

Many of the Branches are suspending operations until their busy time of harvesting is over. Despite this, there is this month a record of much useful and instructive work. To enable a report of the meetings to be promptly published in the *Agricultural Gazette*, will Hon. Secretaries please forward to the Department as quickly as possible an account of their proceedings, and a resumé of the papers read.

Bonville.

The Chairman of this Branch is Mr. L. F. Uther (an ex-student of the Hawkesbury Agricultural College); Vice-Chairman, Mr A. E. Shepherd; Honorary Treasurer, Mr. R. Kelly; Honorary Secretary, Mr. H. B. Faviell. The annual subscription is 2s. 6d., and the regular meeting day the Wednesday evening after the full moon in each month.

At the meeting held on the 8th November, Mr. J. B. Williams read an instructive paper on "A Vegetable Garden for the Farm."

Mr. G. Marks, Instructor in Agriculture, delivered a lecture on the 4th December, in which he referred to the difficulties in the early stages of a dairying district in getting good herds together, and gave some advice on the subject. He also dealt with "Fodder Crops and Silage," and his instructive lecture was much appreciated.

Messrs. J. Host and N. Harvie have been elected members.

Cardiff.

The Assistant Fruit 'Expert, Mr. J. G. R. Bryant, will give a lantern lecture on the 5th January on fruit culture, diseases of fruit-trees and their remedies, and the packing of fruit.

Dubbo.

Mr. J. G. R. Bryant, the Assistant Fruit Expert, will lecture to the members on "Fruit-growing" on the 20th January.

Gunning.

The annual subscription of this Branch has been fixed at 2s. 6d., and sixteen members have already joined.

Inverell.

At the annual meeting of this Branch, office-bearers were elected for the ensuing twelve months as follow:—Chairman, Mr. F. A. Lewin; Vice-Chairman and Honorary Treasurer, Mr. J. Ditzell; Honorary Secretary, Mr. W. A. Kook (re-elected). The membership fee was fixed at 3s. per annum, and the regular meetings will take place on the Saturday on or before the full moon of each month. On the 14th December, Mr. A. H. E. McDonald, Inspector of Agriculture, delivered a lantern lecture on "Pigs," and dealt with the various breeds, feeding, management, breeding, houses, diseases, &c.

Katoomba.

The first Wednesday in the month has been fixed as the day for the regular monthly meetings. At a recent meeting a discussion took place on the production of crops and vegetables, and a special effort is to be made to have exhibits in readiness for the next Katoomba Show. It was decided to support the proposal to complete the road from Katoomba to the Megalong Valley.

Keepit.

A paper on "Horse-breeding" was read by Mr. J. B. Fitzgerald (Honorary Secretary) at the November meeting, when an interesting discussion took place as to the best methods of improving our draught horses. A motion was eventually passed, "That the Government examination of stallions be made compulsory, and that all sires failing to gain certificates be debarred from public service."

Little Plain.

The branch held its usual monthly meeting, and also the annual meeting, on the 2nd November. A paper was read by Mr. W. Maher on "Making and Stacking Hay," in which he pointed out that to have good saleable hay it should be cut and bound when the sap is in the straw, just after blossoming, and, if possible, got in dry. In good sunny weather it is found that six to nine days would be sufficient to dry it, although black oaten hay would take a little longer. To test the dryness of the hay, a few straws should be taken from the inside of a sheaf and twisted round tightly by the hands. If there is not any sign of sap from the straws, although still a little tough, the hay is fit for stacking, and should be got in as quickly as possible. He considered Marshall's No. 3

wheat the most suitable for hay in his district. In his experience he found that building the stacks in the vicinity of the crop is the quickest and most profitable way of dealing with it. The following officers were elected for the ensuing year:—Chairman, Mr. W. White; Vice-Chairmen, Messrs. E. Blyth and W. Tonkin; Honorary Treasurer, Mr. C. Rainger; Honorary Auditor, Mr. E. Bateson; and Honorary Secretary, Mr. F. S. Stening (re-elected). Mr. Inspector Pinn will give a lecture on potato culture on the evening of Tuesday, the 16th January, and arrangements are being made for another lecture to be given by Mr. Inspector McDonald.

Orchard Hills.

Members of this branch are desirous of obtaining seed more reliable than they receive at present, and true to name, and with that object have approached the Department. They have been informed that seed in bulk can be purchased from the various Government Experiment Farms, and small trial packets of special varieties are distributed to individual farmers from time to time. Seed for spring sowing has all been distributed, and applications for seed for autumn sowing should be made by 1st March.

On the 7th December, Mr. T. G. Palgrave, M.R.C.V.S., Veterinary Surgeon of the Department, gave a lecture on "Diseases of Horses," in which he dealt with strangles, influenza, tetanus, and other diseases. His lecture was particularly appreciated by those present, and after it many questions were asked by the members and information given by the lecturer.

Penrose.

The Assistant Fruit Expert (Mr. Bryant) gave a lantern lecture at Penrose, on the 8th December, on "Apple Culture." The lecture was delivered in the apple-packing shed, at Mr. T. Hewson's orchard, and attracted a large audience, including many ladies.

This Branch will hold their regular meetings on the first Monday evening in each month.

Sackville.

Mr. Max Henry, M.R.C.V.S., Government Veterinary Surgeon, delivered a lecture on "Horse-breeding," at the School of Arts, on 8th instant. The lecturer pointed out from how many aspects the question might be approached, and principally dealt with the hygienic standpoint, emphasising the necessity of soundness in stud stock, also the desirability of providing a good feed supply to young growing stock and to mares in foal. The question of abortion and sterility in mares was gone into at some length, and the possibility of contagious abortion being present in the country was discussed. The possible effect of the Government scheme of examination of stallions was considered, and the necessity shown by it for breeding less from mongrel and unsound stallions. Mr. Henry described heredity unsoundness, sidebone, ringbone, spavin, curb, bursal enlargements, shivering, nasal disease, and roaring; and pointed out the neglect which these diseases have received generally in New South Wales.

Regular meetings of this Branch are held on the Friday nearest to full moon.

Tenterfield.

An attempt is being made to form a branch at Tenterfield, the matter having been favourably considered by the Committee of the Tenterfield Pastoral, Agricultural, and Mining Society. The Department appreciates the action of the Society, and will be glad if residents of the district who wish to join the branch will communicate with Mr. F. W. Hoskins, of Tenterfield.

Toronto.

At a meeting held on 1st November, at Toronto, a Branch was formed which has now twenty-five financial members. The following office-bearers were elected:—Chairman, Mr. P. F. Newman; Vice-chairman, Mr. S. Harris; Hon. Treasurer, Mr. J. Cockburn; and Hon. Secretary, Mr. J. G. Desreaux. The annual subscription is 2s. 6d. Meetings are to be held at the School of Arts, Toronto, on the Wednesday night in each month nearest the full moon.

Wagga.

Arrangements are being made for Mr. Veterinary Surgeon Palgrave, to lecture on "Conformation and Unsoundness in Horses," on 14th February.

Walla Walla.

Mr. H. G. White, the Superintendent of the Viticultural Station at Howlong, visited Walla Walla on the 30th November, and gave a demonstration on "Budding and Green Grafting." In the evening a short lecture was delivered in the local hall, and the processes again demonstrated, as well as the method of budding the peach and lemon.

Wyan.

This Branch has been availing itself of the opportunities afforded by the Department by obtaining from it expert advice on sheep fluke, which has been found to be troubling the stock in the district.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

RHODES GRASS.—" W.H.W." (Epping) : You are quite right about the space occupied by a pound of seed. A well grown sample should occupy a considerably less space than a gallon.

The seed sown five weeks ago should certainly be well up by this time. It is difficult to say why it has failed to germinate, but Rhodes grass seed does not keep too well, and it may have perished. If you have any seed left, please supply a sample to test. Generally, Rhodes grass is showing well above ground a month after the seed is sown.—GEO. VALDER.

CONTENTS OF ROUND TANK OF OATS.—" W.O.E.H." : Square the radius in inches and multiply by 3·1416 ; then multiply by depth in inches, and divide by 2,218 (the number of cubic inches in a bushel). Your tank being 20 feet deep and 16 feet in diameter, the contents are $\frac{96 \times 96 \times 240 \times 3{\cdot}1416}{2218} = 3{,}132$ bushels.—GEORGE VALDER.

DISEASE OF GRAPE LEAVES.—" W.W." : The disease showing on the specimens forwarded is Anthracnose, or " Black Spot " of the vine. It is common in all vineyards, and will develop and spread when wet weather prevails in spring and summer. The only effective treatment is the preventive measure described in the leaflet which has been sent to you.—M. BLUNNO.

BLEACHED WHEAT FOR SEED.—" E.J.L." : Bleaching, due to excessive rainfall before harvesting, does more or less affect the grain for seed purposes, but it can be used, provided it is sown more thickly. In any case it is advisable to test it for germination, and then the quantity to be sown can be accurately gauged.—GEO. VALDER.

Emperor Mandarin Tree, thirty years old.

Growing in Mr. Lewis Stuart's orchard, Upper Colo, and carrying 20 cases of fruit.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (imp).	Wollongbar Farm	*
" ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
" ...	Royal Pansy ...	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey ...	Thessalian II. ..	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
" ...	Jamaica Jack ..	Sir Jack ..	Rum Omelette (imp.).	Wollongbar Farm	*
" ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ...	*
" ..	Grenadin .	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
Guernsey ...	The King's Mirror.	Calm Prince ...	Vivid (imp.)...	Casino	26 May, '12.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Lismore	31 July, '12.
" ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Palmer's Island ...	15 April, '12.
" ...	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Casino	11 July, '12.
" ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Milton	1 Feb., '12.
" ...	Monsieur Beaucaire.	Calm Prince ...	Flaxy (imp.)	Grafton Farm ...	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
" ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
" ...	Prince of Warren Wood (imp.).	Kingsmoor Governor.	Quail... ...	Port Macquarie ...	20 Mar., '12.
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Berry Farm ...	*
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	Singleton	21 April, '12.
" ...	Calm Prince ...	Rose Prince (imp.).	Gentle (imp.)	Berry Farm ...	*
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 Nov., '12.
" ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
Ayrshire ...	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
" ...	Jamie's Ayr ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm.	*
" ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
" ...	Julius Cæsar ...	Auchenbrain Spicy Jock (imp.)	Julia	Grafton Farm ...	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	H.A. College, Richmond	*
"	Bratha's Boy ...	Aicme Chin (imp.)	Bratha 4th	" "	*
"	Rising Sun ...	Bratha's Boy ...	Dawn ..	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

Department of Agriculture,
Sydney, 2nd January, 1912.

BULLS FOR SALE

BERRY STATE STUD FARM.

SHORTHORNS.—Hamlet: sire, Royal Hampton X (imp.); dam, Panacea; calved 30th November, 1910; colour, red. Price, **£15.**

Panacea is by Dora's Boy from Pansy Girl. Pansy Girl is by Favourite (imp.) from Australian Pansy. Australian Pansy is by Airy Knight II from Pansy IV (imp.).

The Pansy strain has proved a good dairying one through several generations of cows.

* **Henry Irving:** sire, Royal Hampton X (imp.); dam, Fauvette; calved 25th December, 1910; colour, red and white. Price, **£30.**

Fauvette is by Favourite (imp.) from Oxford's Fanny. Oxford's Fanny is by Oxford's Forest King from Fanny 78th (imp.)

Fauvette yielded 7,132 lb. of milk last season.

JERSEY.—Sir John Flower: sire, Sir Jack: dam, Calceolaria (imp.); calved 2nd November, 1910; colour, whole. Price, **£30.**

Sir Jack is by Omelette's Pride from Lady Tidy III. Omelette's Pride is by Lucy's Pride from Rum Omelette (imp.). Lucy's Pride is by Melbourne (imp.) from Miss Lucy III (imp.).

ARYSHIRES.—* James Primrose: sire, Auchenbrain Spicy Jock (imp.); dam, Miss Prim; calved 9th November, 1910; colour, white and brown. Price, **£15.**

Miss Prim is by Mischiefmaker of Barcheskie (imp.) from Primrose of Barcheskie (imp.). Miss Prim yielded 5,834 lb. of milk last year, when she was 12 years old.

* **Sir Julian:** sire, Auchenbrain Spicy Jock (imp.); dam, Lady Julian; calved, 5th December, 1910: colour, brown and white. Price, **£15.**

HAWKESBURY AGRICULTURAL COLLEGE.

GUERNSEY.—*Alexander the Great: sire, Claudius; dam, Alexandrina of Richmond; gd., Alexandrina IX (6399, E.G.H.B.); 3d, Alexandrina II (3220, E.G.H.B.); 4d., Alexandrina (3219, E.G.H.B.); calved 6th November, 1910. Price, **£40,** on rail at Richmond.

H. C. L. ANDERSON, Under Secretary.

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* Applications for these bulls will be held till 21st January, 1912. If more than one application be received for any one bull, his disposal will be decided by ballot.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue Alteration of dates should be notified at once.

1912.

Society.	Secretary.	Date.
Coramba District P., A., and H. Society	H. E. Hindmarsh..	Jan. 16, 17
Albion Park A. and H. Association	H. G. Fraser	,, 17, 18
Gosford A. and H. Association...	R. J. Baker	,, 26, 27
Kiama A. Association	R. Somerville	,, 26, 27
Wollongong A., H., and I. Association	M. A. O'Donnell...	Feb. 1, 2, 3

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

Society.	Secretary.	Date.
Berry A. Association	C. W. Osborne	Feb. 7, 8
Moruya A. and P. Society	P. Flynn	,, 7, 8
Tumut A. and P. Association	T. E. Wilkinson	,, 13, 14
Manning River A. and H. Association (Taree)	S. Whitbread	,, 14, 15
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	,, 20, 21, 22
Gunning P., A., and I. Society	J. R. Turner	,, 21, 22
Ulladulla A. Association (Milton)	J. Boag	,, 21, 22
Central Cumberland A. and H. Society (Dural)	H. A. Best	,, 23, 24
Quirindi District P., A., and H. Association	G. Fowler	,, 27, 28, 29
Dapto A. and H. Society	J. H. Lindsay	,, 27, 28
Alstonville A. Society	W. W. Monaghan	,, 28, 29
Inverell P. and A. Association	J. McIlveen	,, 28–Mar. 2
Hawkesbury District A. Association (Windsor)	H. S. Johnson	,, 29 Mar. 1, 2
Bangalow A. and I. Society	W. H. Reading	,, 5, 6, 7
Narrabri P., A., and H. Association	D. J. Bridge	,, 5, 6, 7
Southern New England P. and A. Association (Uralla)	W. C. McCrossin	,, 5, 6, 7
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 5, 6, 7
Bega A., P., and H. Society	W. A. Zingel	,, 6, 7
Braidwood P., A., and H. Association	L. Chapman	,, 6, 7
Coonabarabran P. and A. Association	G. B. McEwen	,, 6, 7
Warialda P. and A. Association	A. J. Devine	,, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 7, 8
Nepean District A., H., and I. Society	P. J. Smith	,, 7, 8
Wauchope P., A., and H. Society	A. D. Suters	,, 7, 8
Narrabri P., A., and H. Association	D. J. Bridge	,, 7, 8, 9
Oberon A., H., and P. Association	A. E. Burcher	,, 8, 9
Wyong A. Association	J. H. Kay	,, 8, 9
Bombala Exhibition Society	W. G. Tweedie	,, 12, 13
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 12, 13, 14
Campbelltown A. Society	F. Sheather	,, 13, 14
Cobargo A., P., and H. Society	T. Kennelly	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 13, 14, 15
Bowraville A. Association	C. Moseley	,, 14, 15
Port Macquarie & Hastings Dist. A. and H. Society	W. R. Stacy	,, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts	,, 14, 15, 16
Blayney A. and P. Association	H. R. Woolley	,, 19, 20
Gundagai P. and A. Society	A. Elworthy	,, 19, 20
Gloucester A., H., and P. Association	S. J. Bignell	,, 20, 21
Merriwa A. and P. Association	A. V. Budden	,, 20, 21
Queanbeyan P., A., H., and I. Association	E. C. Hincksman	,, 20, 21
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Newcastle A., H., and I. Association	C. W. Donnelly	,, 21, 22, 23
Walcha P. and A. Association	J. N. Campbell	,, 26, 27
Luddenham A. Society	F. Shawe	,, 26, 27, 28
Tamworth A. and P. Association	J. R. Wood	,, 26, 27, 28
Molong P. and A. Association	W. J. Windred	,, 27
Cooma P. and A. Association	C. J. Walmsley	,, 27, 28
Yass P. and A. Association	W. Thomson	,, 27, 28
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 27, 28, 29
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 27, 28, 29
Liverpool A., H., and I. Society	W. E. Learoyd	,, 28, 29, 30
Royal Agricultural Society (Sydney)	H. M. Somer	April 2–10
Adaminaby P. and A. Association	W. Delany	,, 10, 11
Bathurst A., H., and P. Association	J. Bain	,, 17, 18, 19
Hunter River A. and H. Association	E. H. Fountain	,, 17–20
Moree P. and A. Society	D. E. Kirkby	,, 23, 24, 25
Richmond River A., H., and P. Society (Casino)	D. S. Gayner	,, 23, 24, 25
Orange A. and P. Association (Jubilee Show)	W. Tanner	,, 24, 25, 26
Dungog A. and H. Association	C. E. Grant	May 1, 2.
Clarence P. and A. Society (Grafton)	G. N. Small	,, 8, 9, 10
Coonamble P. and A. Association	J. M. Rees	,, 8, 9

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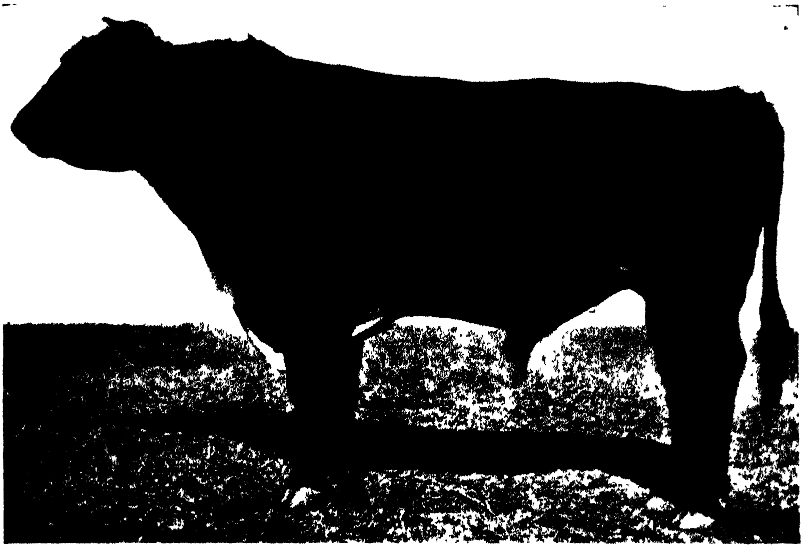


Shorthorn Bull, Royal Hampton (imp.).

Shorthorn Cow, Waratah.

IMPORTED STOCK AND THEIR PROGENY.

Ayrshire Bull, Emerald's Mischief.

Ayrshire Cow, Primrose 2nd.

IMPORTED STOCK AND THEIR PROGENY.

VOL. XXIII. PART 2. FEBRUARY 2, 1912.

Agricultural Gazette of New South Wales.

Imported Stock and their Progeny.

CATTLE-BREEDING AND DAIRY RECORDS.

M. A. O'CALLAGHAN, Dairy Expert.

THE question of the importation of dairy stock has recently been discussed to some extent, owing to the fact that a request was made by the representatives of the Dairy Farmers' Association of New South Wales, that the Minister of Agriculture, the Honorable J. L. Treflé, should set about importing more cattle of recognised dairy breeds.

There are a number of people who are opposed to the breeding of stud dairy cattle on Government farms for various reasons, but as the number bred is not sufficiently large to in any way seriously interfere or compete with private breeders, men who have given the matter any thought agree that the introduction of high-class cattle by anybody into New South Wales is of benefit to that State. There are, of course, some people who appear not to believe in the advantage of pure bred sires at all, and such people, no doubt, are jealous of either the Government or any other breeder running stud farms on pure lines, simply because they know it is only a question of time when, if importations are being constantly made by studmasters, dairy farmers will be able to obtain pure-bred bulls of good descent at a price which will not prohibit the smallest dairy farmer in New South Wales from owning a pure bred bull; and thus, of course, the demand for the cross bred or mongrel bull will cease, and a number of people, who go to the trouble of raising one or two of these cross-breds every year, will be affected somewhat. We have, however, a long way to go yet before this desirable standard can be reached.

There are, approximately, 600,000 mature dairy cows in New South Wales. This means that we would require about 10,000 pure-bred bulls to meet our present requirements, and unfortunately there are not nearly a sufficient number of pure-bred cows of all breeds in New South Wales to produce anything like what would meet these requirements, even if all male calves from pure-bred cows were good ones and lived. I have latterly had a number of observations made on the dairy herds of farmers in various districts, and it is pleasing to be able to state that indications generally point in the direction of a desire on behalf of farmers to obtain pure-bred bulls, even though the prices of good ones are higher on the average in this country than they are in the British Isles.

We have recently heard a good deal about the herd-testing movement throughout the world, and we have heard something about individual records of cows put up in New South Wales and elsewhere. In an ordinary crossbred dairy herd, kept for the purpose of milk and butter production, and for the income derivable therefrom, we should undoubtedly endeavour to obtain the very highest results, and all our aims in the selection of sires should be with the object of obtaining a pure-bred animal which will cross well with the herd, and which will also convey vigour and productive capacity to his progeny. The fact remains, however, that there is ample evidence that in the past farmers, not only in this country but elsewhere, have been greatly misled in their selection of sires, by paying too much attention to the milk yields of the dams, while practically disregarding the sire's female ancestors. Results of experiments published by me about eighteen months ago went to show that the milking characteristics were more frequently conveyed through the sire than through the dam; but apart from this there is another reason —and a very important one from a physiological point of view—why farmers would do well to consider other things than mere production when selecting young bulls to introduce into their herds.

Recently, in reading an American publication, I was struck with a remark made by one writer, to the effect that he would like to have a bull in his herd the progeny of a dairy cow in the American Advanced Register, but that he would like the bull to have been born before the cow put up the milk and butter yield which entitled her to a place in such register. Here a question is touched which vitally concerns the management and breeding of stud dairy cattle.

All naturalists of experience have shown us that so long as we study nature's laws and work in harmony therewith, we can improve animal and plant-breeding to a very great extent; but when we endeavour to obtain success along lines which mean the continual violation of nature's laws, our work must eventually end in failure. Now, nature demands that the cow shall be at rest for three to six months prior to her giving birth to a calf, thus reserving all the nerve force and vitality which is necessary for the best reproduction of the species. The methods of many so called dairy cattle breeders are very antagonistic to this unalterable law of nature. It is absolutely impossible for a cow, which is yielding large quantities of solid matter in her milk up to within five or six weeks of calving, to do full justice to the reproduction of her own species, and thus it is that so many bulls obtained from high-yielding cows are a failure at the stud. That great nerve force and vitality which is necessary in the sire that is to reproduce in a high degree the good characteristics of his progenitors, cannot be expected to be met with in an animal from whose mother the demands of man have been continued until the fœtus is nearly full-grown. It should be remembered that there is nothing which we could think of which makes a greater demand on the nerve force of the system than does the production of milk in large quantities, and we must also bear in mind that the reproduction of the species also makes a very heavy demand on the nervous system. The double strain must mean the impoverishing of the fœtus in the cow with a tendency to yield large quantities of milk or solid matter in her milk.

The general practice of Australian dairy farmers is to allow the bull to run with the herd all the year round. This is even the method of most of those who keep bulls from their best cows for sale. Now a cow will take the bull a month after calving, provided the calf is not being reared on the dam. This means that the mothers of our future bulls, if they are deep persistent milkers, do not in a good year go dry more than a month before giving birth to their next calf; and to make matters worse for the offspring, the mothers, unless during a year of plenty, do not get an opportunity to build up their systems, for there is no regular or methodical feeding of our dairy cows.

Let us contrast these methods with nature's teachings. The cow that suckles her young will not conceive, as a general rule, while the calf is yet young and is demanding a good quantity of food in the shape of nutritious milk. Rarely, indeed, will such a cow take the bull until she is more than three months calved. In fact, five months is nearer the average. This means that she is not yielding milk for about four to six months before giving birth to her calves, and thus the fœtus is given an opportunity to be thoroughly nourished, and to have the nerve force and capacity to convey his (if a male) characteristics to his progeny. Beef cattle breeders have been extraordinarily successful in obtaining uniformly good results; but then, these breeders do not persistently violate nature's most cherished laws.

Our dairy cattle breeders in the past have been forced to cross-breed very largely in order to obtain that constitution and nerve force in their cows which give good results. Is it any wonder that this is so? The Ayrshire bull saved many an Illawarra herd from being almost useless. Why? Because the strange blood not only tended to more vigour in the offspring, but such bulls, if not imported from Scotland, were generally obtained from careful studmasters here, who took excellent care to see that the bulls did not have indiscriminate access to the stud cows; just in the same way that our successful breeders of pure-bred stock to-day only allow their stud cows to have access to the bull in a way which will ensure that the mothers will have about three months' rest before calving time comes round. If our dairy farmers had had a little more knowledge of the physiology of the cow, they would no doubt have selected bulls bred on different lines to what has been the general practice in the past.

The manager of one of the largest dairy cattle breeding estates in Australia recently remarked to me that we get all our best dairy heifers from medium-class cows. That was not only his own experience, but it was the result of his observations generally. Can we expect any other results while we continue the present methods? Is not this a direct answer from nature, that she will not allow man to violate her laws without penalty? The medium cow that produces the high-class heifer is usually dry three months at least before she gives birth to her next calf. Is not the writing on the wall? Like only begets like when we do not work in direct contravention to nature's laws, and there is certainly nothing in nature's teaching which gives any indication that it is a good practice to semi-starve the future offspring for the sake of obtaining an extremely large milk yield from a cow.

"The proof of a pudding lies in the eating," and the best proof of the value of a bull is through his progeny. The practice on the Government Stud Farm has been to subordinate milk yields to the production of the species in a high order. In other words, once a cow has shown herself to be first-class there is no effort made to continue to obtain from her a large quantity of milk and butter per year. It is rarely, indeed, that complaints are made of the progeny of Government bulls that are leased or sold to dairy farmers, while, on the contrary, letters are frequently received pointing out the improvement in the progeny of these bulls over their female ancestors.

With reference to the three importations of stud cattle by the New South Wales Government, I might add that I am in a position to criticise them thoroughly, because I have not taken part in the selection of any of these cattle; and I might state that, with the exception of the Shorthorns, all the animals imported in 1898 have proved their worth beyond doubt, while the Shorthorns, on the other hand, have not reproduced high-class dairy cattle as frequently as was desirable. But this is only to be expected, for though four at least out of six of the imported cows were good ones, still it must be remembered that the English stud book Shorthorn cows have all been bred from a beef ancestry, and hence the throw-back to the beef type must crop up frequently. The bulls of this breed, when mated with cross-bred animals, have done fairly well, but it will be readily understood that the tendency to throw-back to the beef type is considerable when quarter herd-book Shorthorn cows are mated with quarter-herd book Shorthorn bulls. Some excellent specimens of the breed have, however, been produced both at Berry and Wollongbar, but it takes a long time to establish a race of milking Shorthorns whose ancestry can be traced to beef blood of fairly recent date. The Australian type of dairy Shorthorn is very similar to the Irish type of dairy Shorthorn, for the simple reason that it was evolved from the old Shorthorn before that breed was converted into a beef one.

The second importation consisted of Guernsey cows solely, and while they were not all quite as high-class as the first importation, most of them have proved themselves to be good dairy cows and good breeders.

The last importation, which consisted of Guernseys, with a couple of Jerseys and a Holstein, is of too recent a date for one to be able to criticise the animals through their progeny; but the bulls especially are well descended, and have all the appearance of being able to beget high-class dairy cattle.

The question of tuberculosis in imported cattle is undoubtedly one that requires further light thrown on it. The disease made itself evident in the first lot of imported cattle. While they were then at Kirkham, near Camden, three out of six heifers reacted to the tuberculin test soon after their arrival, notwithstanding the fact that they had been tested in England and carried veterinary certificates to that effect. With regard to the second importation, the experience was somewhat similar. The animals were tested not only in England but on their arrival in Sydney, yet three of the females reacted to the tuberculin test about six months later.

As regards the last importation, we have still more definite results. The animals passed the tuberculin test in England, and passed the test also on arrival in Sydney, but three of them reacted to tuberculin a couple of months ago. On this latter occasion, however, the State was protected against monetary loss, because the animals were insured against the development of tubercular disease for twelve months from the date of purchase. These facts, however, and similar experiences of their own, make private breeders hesitate, and it looks as though greater care will have to be exercised in connection with the application of the tuberculin test in England, so as to preclude any possibility of the purchase of animals that may have been tampered with so as to prevent the test giving a reaction. If it is shown that all reliability can be placed on the way in which the testing has been done in England, then it would appear that the development of latent tuberculosis, through the application of tuberculin, is more common than is generally admitted.

With regard to the records and types of stock bred from imported animals, the animals illustrated herewith will go to show the type that has been imported and produced, and the yields representing the different females will give breeders an idea of what these animals will do under normal conditions, and without any effort towards the production of big yields.

SHORTHORNS.

The Pansy Family.

This has been a good dairy family right through, and not only have the heifers done well, but the bulls—of which there have been many—have proved themselves capable of begetting high-class dairy heifers at our Wollongbar and Grafton Farms. The following records were obtained on ordinary feed, and while the animals were being treated as breeders rather than mere milk producers. The cows, with the exception of Pansy 4th, were in the herd last year:—

Pansy 4th (imp.), by Umpire 13th from Pansy 2nd, gave 5,710 lb. of milk, testing 3·7 per cent. butter fat, or equal to 244 lb. of butter. She gave 59 lb. of milk in one day.

Australian Pansy, by Airy Knight 2nd from Pansy 4th, gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter fat. She lost a teat later, but has been a good breeder.

Forest Pansy, by Oxford's Forest King from Australian Pansy, gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. butter.

Pansy Girl, by Favourite (imp.) from Australian Pansy, gave 6,396 lb. of milk in 1910, with a test of 4 per cent. butter fat, equal to 300 lb. of butter.

Waratah, by Dora's Boy from Australian Pansy, on her second calf gave 5,305 lb. of milk last season, and is milking more heavily this year. Her butter yield was 223 lb.

Flower Girl (late Dora's Flower), by Dora's Boy from Forest Pansy, on her second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter fat, and is still milking well.

Panacea, by Dora's Boy from Pansy Girl, on her *first calf*, last year gave 4,250 lb. of milk, testing 4 per cent. butter fat, equal to 200 lb. of butter.

Pansy's Progress, born 1908, by Dora's Boy from Pansy 4th (imp.)—now at Wollongbar State Farm—represents the Pansy family in the male line on Government farms ; and his sire being of the Lady Dora family, the blood should be productive of good dairy cattle.

Dorpan, by Dora's Boy from Pansy 4th, born 4th March, 1907, and sold to Mr. C. O. Whatson, of Ghinni Ghinni, is a full brother to Pansy's Progress.

Royal Pansy, born 1909, by Royal Hampton (imp.), from Australian Pansy, is another male of this family of much promise. He is at present leased to Mr. J. B. Kelly, of Lismore.

To breeders in search of pure Shorthorn blood, I can commend sires of the Pansy family, as both the males and females of this line have given good results.

The Fanny Family.

Fanny 78th, born in 1895, was imported in 1898, and was bred by Charles Hobbs, Maisey Hampton, England. Her sire was Royal Nottingham (59,834), her dam Fanny 32nd, by Devonshire (47,686), Coates' Herd-book.

Shorthorn Cow, Fanny 78th (Imp.).

She gave birth to a bull calf on 23rd September, which was sold to Mr. M. Rush for fifty guineas. Fanny 78th yielded 7,060 lb. of milk, testing 3·75 per cent. on the average, or equal to 310 lb. butter. Her largest yield on grass feed was 49 lb. per day. Though Fanny gave more milk than Pansy in a season, and though her line has produced some good milkers, still the Pansy family has been more consistent in producing good females. Fanny's representatives in milk last year were:—

Fauvette, born 1904, by Favourite (imp.), from Oxford's Fanny, by Oxford's Forest King, from Fanny 78th (imp.), gave 7,132 lb. milk in 1911. The dam of Fauvette died too young to have a mature milk record. Fauvette is a handsome dairy cow.

Lady Fanny, born 1899; sire, Lord Sangrave (imp.); dam, Fanny 78th (imp.). Last year she gave 3,857 lb. milk, with an average test of 3·8 per cent. fat, equal to 172 lb. butter. She is a coarse-looking cow. She usually made a good show, but was not a persistent milker. Her daughter, by Dora's Boy, is a nice dairy beast of promise.

Dewdrop, born in 1907, by Dora's Boy from Lady Fanny. As a heifer on first calf she gave 4,133 lb. milk, testing 4·0 per cent, equal to 194 lb. butter. She is in milk again, and was yielding 4 gallons per day after calving. She gives promise of making a good dairy cow, and has yielded 11½ lb. butter in a week.

The Lady Dora Family.

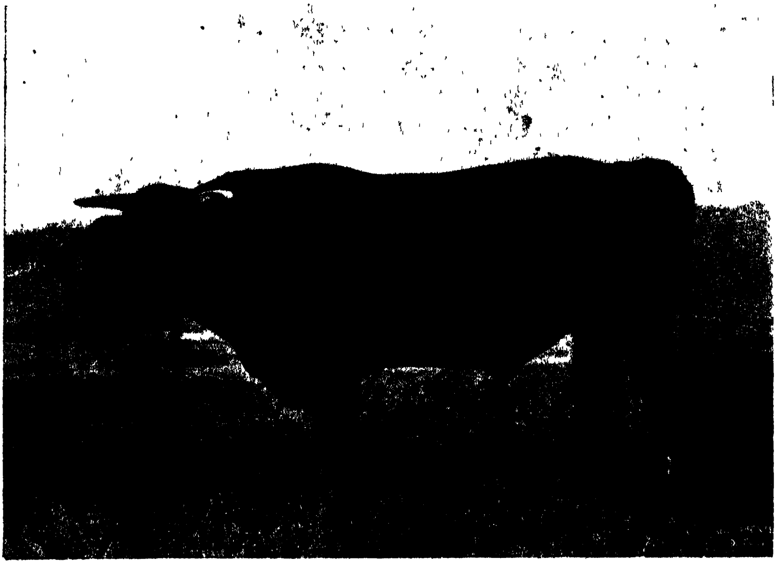
Lady Dora was imported in 1898; was born in 1892, and was sired by Paradox, dam Deodora 9th. She was bred by T. Mathews, Harlow, Essex, England. Transferred to Wollongbar Farm from Berry in June, 1900. She yielded at Berry Stud Farm 8,130 lb. of milk, which produced 287 lb. butter, in a milking period of thirty-two weeks. At Wollongbar she yielded 9,560 lb. milk in 265 days. Her first daughter, Dora Sandgrave, by Lord Sandgrave (imported), died as a heifer after giving birth to

Dora, by Pansy King (a son of Pansy 4th, and by Lord Sandgrave), yielded 7,868 lb. milk, with an average test of 3·7 per cent., or equal to 342 lb. butter. She thus beat her grandmother's record at Berry Farm. There is a heifer from this cow on the Farm named Dora Dora which is inbred, but is too young to be judged on her record so far.

Dorinda.—This is an inbred daughter of Lady Dora (imp.), being by Dora's Boy. On her fourth calf she yielded 7,554 lb. milk, equal to 355 lb. butter, in 276 days. She was bred at Wollongbar, and is now there.

Lady Dora 2nd was an early calf from Lady Dora (imp.) by Island King, but she was culled as not being up to our standard.

Lady Dora (imp.) was bred to a Guernsey bull, and the result of the cross was *Doreen*, a cow that has given 8,243 lb. milk, which produced 407 lb. butter in 262 days at Wollongbar.



Shorthorn Bull, Dora's Boy.

Dora's Boy, by Cornish Boy (imp.) from Lady Dora (imp.), was the best of the male line, and he proved himself a successful sire at both Berry and Wollongbar.

The March Daisy Family.

March Daisy was born in 1892, was imported in 1898, and was by Vivian (60,134, C.H.B.) from Mistress Daisy 2nd. This was a very fine type of dairy cow. She left no female offspring, as, after being transferred to the Hawkesbury Agricultural College, she died soon after giving birth to a bull calf by Lord Sandgrave, which was named Earl March. She yielded 5 gallons of milk a day for some time after calving.

March Pansy, born October, 1904, by Earl March from Australian Pansy, the only direct living pure-bred representative of the March Daisy family. He is stationed at Grafton Experiment Farm, and his heifers are of much promise.

Honey 110*th* and *Alexandra* 14*th* are two of the imported cows of which we have no pure-bred representatives on the Stud Farm. The former was transferred to Wollongbar, where, when mated with a Guernsey bull, she gave good results. Her progeny with Shorthorn bulls were not up to dairying standard. The latter is represented through her son Oxford's Forest King, the sire of Forest Pansy.

From these notes it will be seen that the bulls which gave best results at Berry were Favourite (imp.) and Dora's Boy. The Shorthorns on the Farm now of pure English Shorthorn blood are worthy representatives of that breed. They are dual purpose cows, and fatten rapidly when not in milk.

There were four Shorthorn bulls imported in 1898, viz., *Favourite, Lord Sandgrave, Cornish Boy,* and *Clipper.* The last-named was never used in the stud, having become tuberculous after two years' lease. When on lease at Singleton, however, he sired the many-times champion bull at Sydney Royal Show—*Skipper.* What Skipper's female progeny are like I have no authentic records; but his son, *The Admiral,* got some fine females, which were sold at big prices at Mr. Cook's sale.

Cornish Boy produced *Dora's Boy,* and this latter proved himself a good sire. He also got *Show Boy,* a noted winner on the Richmond River. He got some deep-milking females at Wollongbar Experiment Farm from Illawarra types of Shorthorns.

Shorthorn Bull, Favourite (imp.).

Favourite was the grandsire of Mr. George Tait's champion bull, *Aristocrat of Oakdale*; and judging by Favourite's female progeny at Berry Stud Farm, Aristocrat does not lose anything in reputation by being descended from Favourite.

Lord Sandgrave was a failure as a sire of milkers from pure-bred Shorthorns.

Royal Hampton (imp.) was selected in England by the well-known judge, Mr. Guthrie, of the *Sydney Mail.* His progeny are yet too young to judge of his ability to beget milkers.

THE AYRSHIRES.

Like the English Shorthorns, only one importation of Ayrshire females has been made by the Government, viz., that of 1898. At that time the following cows were imported:—Primrose of Barcheskie, Roseleaf of Barcheskie, Judy 9th of Barcheskie, Dandy of Rattenraw, and Lizzie 4th of Auchenbrain.

Lizzie 4th died after giving birth to two calves. The second was named Bobby Burns, was sold to Mr. Barling, Manilla, and was highly thought of. Her first calf died of white scour.

The Primrose Family.

Primrose of Barcheskie (imp.)—Born, 27th March, 1894; sire, Royal Stuart of Glenbuck (2,678); dam, Lindsay 7th of Barcheskie (6,341).

Miss Prim, by Mischiefmaker of Barcheskie, from Primrose (imp.). Born, 29th November, 1899. Last year, when twelve years old, she yielded 5,834 lb. milk, which showed equal to 240 lb. butter. No finer stamp of Ayrshire than Miss Prim can be seen, though her daughter, Primrose 2nd, is perhaps somewhat more handsome.

Ayrshire Cow, Miss Prim.

Primrose 2nd.—Born, 24th April, 1902; sire, General; dam, Miss Prim. In her milking period, now drawing to a close, she yielded 6,298 lb. milk, in forty-one weeks. The previous year she gave 6,918 lb. milk, testing 4·2, or equal to 343 lb. butter.

Scotch Heather.—Born 2nd December, 1907; sire, Jamie's Ayr; dam, Leafbud. This beautiful brown and white heifer yielded 4,332 lb. milk on her first calf, and as she has been given a good rest, she should nearly double this next season.

Primadonna.—Born 16th January, 1907; sire, Daniel of Auchenbrain (imp.); Dam, Miss Prim. This is a promising heifer. In twenty-eight weeks, on her first calf, she yielded 3,541 lb. milk, testing 3·95 per cent on the average.

Jamie's Ayr.—Born 25th July, 1905; sire, Jamie of Oakbank; dam, Miss Prim. This is a beast of great merit. An offer of £150 was made for him as a 3-year-old, but it was decided to retain him, and he was transferred to Wollongbar Experiment Farm for stud duty, where he now is at the head of the Ayrshire herd, and where he has sired a number of very promising heifers. He got two heifers before leaving Berry, and they are a fine advertisement for him.

Emerald's Mischief.—Born, 4th August, 1903; sire, Prince Emerald (imp.); dam, Miss Prim. This bull did stud duty at Hawkesbury Agricultural College for some years, and he has left some very excellent types of dairy Ayrshires there which will be referred to later on. At last Sydney Show he was purchased by the well known breeder, Mr. J. Porter, of Camden. His head is strong and virile, as becomes a sire. His horns are not typical, but he has a body which made him a favourite with visitors to the College, including Mr. Dunlop (Scottish Commissioner).

The Roseleaf Family.

Roseleaf of Barcheskie (imp.) was born in May, 1893, and imported in 1898. Sire, Traveller of Drumjoan (1,441); dam, Ripple 4th of Barcheskie (5,339). In 1899, Roseleaf yielded 6,000 lb. milk, which showed equal to 234 lb. butter.

Ayrshire Cow, Roseleaf of Barcheskie (imp.).

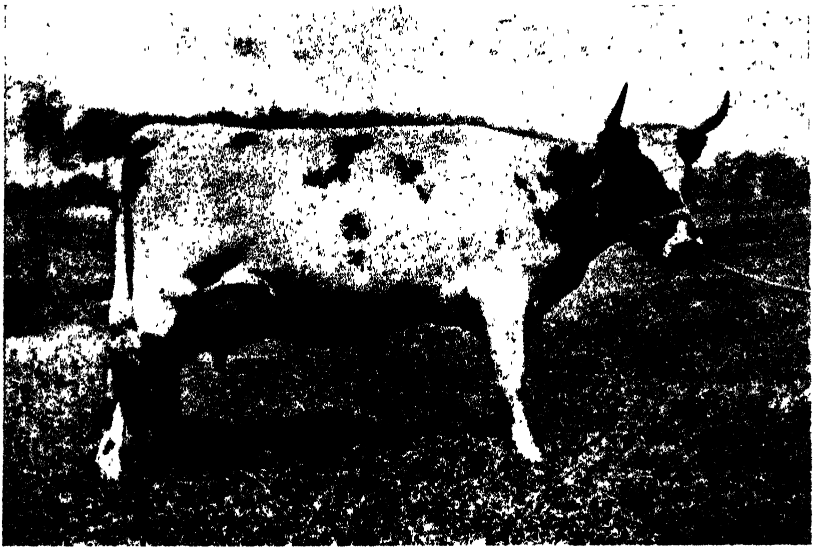
Roseberry.—Born 3rd January, 1900; sire, Mischiefmaker (imp.); dam, Roseleaf (imp.). On her first calf she yielded 5,799 lb. milk, with an average test of 4·1 per cent., or equal to 280 lb. butter. She averaged 49 lb. milk a day for some time after her second calf, but, striking a dry year, put up only 5,079 lb. of milk, with an average test of 4·0 per cent.

Ayrshire Cow, Roseberry (Dry cow, now aged 12 years).

Ayrshire Cow, Ripple Rose.

Ripple Rose.—Born 24th September, 1904; sire, Prince Emerald (imp.); dam, Roseberry. As a heifer on her first calf, she gave 5,820 lb. milk, with an average test of 4 per cent. fat. In 1910 she gave 7,669 lb. milk, with an average test of 3·9 per cent., or equal to 351 lb. butter. This season, to date, she has given 7,063 lb. milk, testing on the average 4·0 per cent.

Leafbud.—Born December, 1903; sire, Prince Emerald (imp.); dam, Roseberry. This is a great young cow. As a heifer, on her first calf, she yielded 4,642 lb. milk, with an average test of 4·3 per cent. fat, or equal to 234 lb. butter. The following year she gave 6,732 lb. milk, which produced 3C9 lb. butter. This season, on her third calf, she has yielded 8,389 lb. milk and is still milking well. As may be seen, Leafbud is full sister to Ripple Rose.



Ayrshire Cow, Leafbud.

Leaflet.—Born, 6th January, 1909; sire, Auchenbrain Spicy Jock (imp.); dam, Leafbud. This heifer is now milking on her first calf. She gave 216 lb. milk, testing 4·2 per cent., or equal to 10½ lb. butter, the third week after she calved.

This is a very high testing family, and hence valuable from a stud point of view for improving Ayrshires from a butter-producing standpoint. *Scotch Mixture*, sold at last Sydney Show to Mr. Perring, is from Ripple Rose; as is also *Jock's Berry*, now at Wollongbar, and *Dan of the Roses*, at Hawkesbury Agricultural College.

The Judy Family.

Judy 9th of Barcheskie, was born in April, 1894, and imported in 1898. Sire, Traveller of Drumjoan (1,441); dam, Judy 6th of Barcheskie (6,335). The year after her arrival she yielded 7,030 lb. of milk, with an average

Ayrshire Cow, Juliette.

Ayrshire Cow. Julia.

fat test of 3·7 per cent., or equal to 297 lb. butter. The following year she gave 6,274 lb. milk, with an average test of 3·88 per cent., which produced 286 lb. butter.

Kirkham Judy.—Born, 24th February, 1899; sire, Peter of Chapelton; dam, Judy 9th of Barcheskie (imp.). On her first calf she gave 4,265 lb. milk, which produced 200 lb. butter. She gave 5,390 lb. milk, with an average test of 4·15 per cent. on her second calf, or equal to 262 lb. butter.

Juliette.—Born 28th January, 1900; sire, Mischiefmaker (imp.); dam, Judy 9th (imp.). This has been a good cow, and though aged she gave 4,504 lb. milk in thirty weeks this season, and is milking well yet. On her second calf she gave 4,505 lb. milk, with an average test of 3·9 per cent., or equal to 206 lb. butter.

Julia.—Born 11th March, 1903; sire, Peacemaker, by Mischiefmaker (imp.); dam, Juliette. This very fine cow yielded 9,971 lb. milk, with an average test of 4·2 per cent., or equal to 492 lb. butter, last season; but unfortunately she was killed by accident, another cow tossing her against a fence and breaking her neck.

Judica.—Born, 26th May, 1904; sire, Prince Emerald (imp.); dam, Juliette. As a heifer on first calf, this animal yielded 3,580 lb. milk, testing 3·6 per cent., or equal to 143 lb. butter. She was ill for some time during this season.

Lady Julian.—Born 8th September, 1906; sire, Daniel of Auchenbrain (imp.); dam, Julia. This heifer on her first calf last year, yielded 3,525 lb. milk in thirty-two-weeks, on grass feed only. She gave 8¾ lb. butter the third week after calving.

Mystery.—Born, 15th June, 1908; sire, Jamie's Ayr; dam, Juliette. This heifer is at present in milk, and the fourth week after calving she yielded 9⅓ lb. butter from 203 lb. of milk. She is of much promise.

Hattie Craig.—Born, 15th April, 1907; sire, Daniel of Auchenbrain; dam, Juliette. This is a promising heifer. She yielded 9⅓ lb. butter from 199 lb. milk the fourth week after calving.

Aurora.—Born 10th December, 1906; sire, Daniel of Auchenbrain (imp.); dam, Judica. This heifer, now in milk, yielded 10½ lb. butter (242 lb. milk), the third week after calving, on grass feed only.

The Dandy Family.

Dandy of Rattenraw (imp.)—Born, April, 1894; sire, Jamie of Torcross (2,461); dam, Princess of Carngillan (5,705). Of the four Ayrshire cows imported in 1898, this was the only one that was not entirely satisfactory, from a dairyman's point of view. She was a fleshy cow, and inclined to be coarse. Her yield in 1901 was 4,925 lb. of milk, which produced equal to 220 lb. butter.

Miss Dandy.—Born, 5th January, 1900; sire, Mischiefmaker (imp.); dam, Dandy of Rattenraw (imp.). This was a better dairy cow than her mother, and in 1903, on her first calf, she yielded 4,920 lb. of milk, which produced equal to 239 lb. of butter, a good record for a heifer on grass feed.

Ratten Maid.—Born, 9th April, 1903; sire, Peacemaker; dam, Dandy of Rattenraw. This heifer did not prove as good as the previous one, her record on her first calf being 3,214 lb. milk with a 3·5 per cent. test.

Other cows of this family are at Wollongbar Experiment Farm.

These represent all the Ayrshires that have been milked on the Stud Farm. As a type, and as milkers under our breeding conditions, it would be difficult to get a better lot of pure-breds. Five from the herd, mainly heifers, have just been transferred to Glen Innes Experiment Farm.

Next month I will deal with the Jerseys, Guernseys, and Holsteins, and also give the record of the Hawkesbury Agricultural College Dairy Herd.

Cattle on pasture, Berry Stud Farm.

Winter Schools for Farmers at Hawkesbury Agricultural College.

THE sixth annual Winter School for farmers was held during June and July last year, the attendance reaching 123. The first Winter School was attended by only sixty farmers, but the numbers have steadily increased until the accommodation at the College threatens to be insufficient for requirements. A summary of the work done last year should, therefore, be of interest to farmers who have not attended any of the schools, as showing the nature of the instruction imparted at what is undoubtedly becoming a very popular annual institution.

The course lasts four weeks, and is open to farmers and graziers, or their sons, who have worked at least one year on the land and are over 16 years of age. A fee of £2 2s. is charged for the course, covering board and lodging at the College. Railways fares at half rates are allowed to all students attending.

The syllabus of instruction varies somewhat from year to year, but covers all branches of agricultural and stock work. Students are expected to select such branches of training as may be best suited to the conditions of their own districts and farms.

The students last winter came from the following districts:—

Gundagai Albury, Mudgee, Tamworth, Dubbo, Trundle, Meranburn, Emerald Hill, Aberdeen, Narrabeen, Tumbarumba, Bellinger, Peelwood, Carlton, Cowra, Wollogorang, Yarra, Goulburn, Oakhampton, Dalton, Tenterfield, Nambucca, Cumnock, Orange, Milbrulong, Cooma, Junee, St. Ives, Hinton, Bibbenluke, Belford, Boggabri, Germanton, Manildra, Coonabarabran, Mullumbimby, Cudgewa, Tuckerimba, Coraki, Casino, Deniliquin, Kangaroo Valley, Rooty Hill, Wahroonga, Macleay River, Laggan, Kangaloon, Molong, Scone, Dapto, Wentworth, England, Muswellbrook, Kiama, Murwillumbah, Seaham, Parkes, Myrtle Cyeek, Bem, Scotland, Reefton, Rawdon Island, Somerton, Chatswood, Bellinger Heads, Curlewis, Armidale, and Cathcart.

The following reports by the experts and lecturers will give an idea of the scope of the work of instruction:—

PRINCIPAL.

During the progress of the Winter School for Farmers of 1911, eighteen lectures of one-hour each were delivered during the day, and eleven lectures, with lantern illustrations, at night. The average attendance at the day lectures was ninety-two, and at the evening lectures 120. The members of the school were taken to Belmont Park and to Clarendon Park, where good lectures were given by Captain W. T. Charley on Yorkshire coachers, Cleveland bays, and hackneys; also Norfolk red polled cattle.—H. W. POTTS.

LECTURER IN CHEMISTRY AND PHYSICS.

A series of ten lectures were delivered on the chief soil physics problems underlying the practice of dry farming, different methods of preparing land for irrigation, systems of applying irrigation waters, and methods for preventing and correcting the accumulation of alkali in soils.

The average attendance for each lecture was eighty.

Two lectures were given on meteorology; attendance, twenty.

One lantern lecture on "Dry Farming"; attendance, about ninety.

The farmers throughout were keen and intelligently interested in all the work, and seemed to find the lectures of practical value.—CUTHBERT POTTS.

VETERINARY SURGEON.

I delivered four lectures to the Winter School as follows:—

(1) Tuberculosis.
(2) Conformation and unsoundness of horses.
(3) Parturition of farm animals.
(4) Shoeing and the care of feet.

I also gave demonstrations as follows:—

First aid to horses and other stock; including drenching, &c.
Post-mortem examinations of cow, pig, and sheep.
Examination of horses for soundness.

The attendance was, generally speaking, fair, and some of the members of the class appeared very keen on the subject; but the class is too large to handle effectively at field demonstrations, and this rendered some of the members rather slack, as they were unable to see what was being done in comfort.—MAX HENRY, M.R.C.V.S.

ENGLISH MASTER.

Six lectures were given on "Handy Measurements for Farmers," &c., at which there was an average attendance of forty-five. In addition, a considerable amount of computation, in connection with problems in land measurement, brought by the students themselves, was worked out with them personally.

Ten lectures and opportunities for class practice in Farm Book-keeping were given, at which there was an average attendance of twenty-six; but this accounted for but a proportion of the time devoted to the subject, as many others who could not attend at the time allotted (1 to 5 p.m.) received individual instruction at various hours of the day. The greatest possible interest was evinced in the subject, and two of the farmers during the month covered the ground usually occupying the ordinary student twelve months, and two others did more than half this quantity. The relations between instructor and students in these two subjects were of the happiest possible character.

In addition to the above, considerable time was devoted during the school to arranging for the practical work with the various outside sections.—PERCY G. GILDER.

INSTRUCTOR IN AGRICULTURE.

There were eleven lectures given and three demonstrations, as follows:—

Lectures.—(1) The soil; (2) Tillage; (3) Farm-yard manure, green manure, rotation and fallowing; (4) Principles of manuring; (5) Commercial fertilisers; (6) Wheat; (7) Oats, barley, and rye; (8) Broom-millet and feed-millet; (9) Maize and sorghum; (10) Potatoes and sweet potatoes; (11) Lucerne and cowpeas.

Demonstrations.—(1) Dipping wheat; (2) Cleaning and grading wheat; (3) Spraying potatoes.

Average attendance at lectures, sixty-six.

Average attendance at demonstrations, twenty-seven.

The members showed great interest in most of the lectures, which were evidently well appreciated.—J. W. HADFIELD.

SCIENCE MASTER.

The following lecture-demonstrations were given in connection with the above school:—

(1) Insect diseases of plants; (2) Fungus diseases of plants; (3) Seed-testing.

The attendance averaged about forty.—W. MERVYN CARNE.

FOREMAN CARPENTER.

The attendance of the Winter School students in my department was very fair, and the majority of them applied themselves excellently.—M. H. ROBERTSON.

EXPERIMENTALIST.

The Winter School farmers were supplied with 3,000 packets farm-seeds; and 500 roots grasses (mostly *Phalaris bulbosa*).

Particulars of demonstrations given may be ascertained from the report of the Instructor in Agriculture. Apart from this, information was supplied to many individuals of the school on various subjects, the principal inquiries embracing:—

(1) Grasses for winter fodder.
(2) Growing of sweet potatoes.
(3) Growing of artichokes.
(4) Growing of maize.

A. V. DONNAN.

ORCHARDIST.

The attendance of farmers at the demonstrations given in the orchard averaged about sixty.

Fourteen attended for practical pruning lessons, and applied themselves to my satisfaction.—JAMES ALFORD.

ENGINEER.

During the 1911 Farmers' Winter School, lectures and demonstrations were given on boilers, engines, pumps, electricity as applied to farm use, and oil-engines.

The attendances averaged twenty-five, and keen interest was taken throughout, more especially in oil-engines, regarding which three special demonstrations were given, in addition to the scheduled list.—C. W. BREBNER.

BLACKSMITH.

The students, to the number of about forty, availed themselves of this branch, and were instructed in the art of welding and working iron and steel. The work shown consisted mainly of that which would be most useful on farms, viz., sharpening and laying shares and coulters, and hardening the points of same with cast-iron; shackles, links and hooks; eyebolts; bolts; cultivator and harrow tines; back and belly-band irons; dees and rings for harness; horse-shoeing and making shoes, &c.

The conduct and attention of students was all that could be desired.—D. H. REAY.

GARDENER.

Farmers were much interested in this branch; more so than at any previous school.

Twelve demonstrations were given, dealing with the many different ways of plant propagation; the collection and treatment of seeds for the raising of trees, shrubs, roses, and flowers; pruning of shrubs, trees, roses, &c. From twenty to sixty farmers attended these demonstrations, with an average of forty.

In addition, a considerable amount of individual instruction was given There was a general desire for plant cuttings and seed of our own collection, and this was complied with as far as our resources allowed.—H. REID.

DAIRY INSTRUCTOR.

Seventeen students attended at the dairy for instruction in dairying subjects, and these showed great interest in their work.

PIG AND BACON EXPERT.

The average attendance at lectures and special demonstrations was thirty-five, whilst a few were in attendance during most of the time throughout the course. It is pleasing to note the keen interest taken in every branch of the work, especially by the older men of the school.

A slight departure was made from the printed syllabus by the combination of the two lectures entitled "The Growth of Suitable Feeds and Feeding" and "The Fattening of Pork and Bacon"; and a lecture was given (with practice) describing the use of the score-card in judging stock. This proved most valuable, and was much appreciated.

Ante and *post mortem* examinations for disease in cattle, sheep, and pigs killed for the College kitchen were also much appreciated. Wherever possible this was done in conjunction with the lectures and demonstrations given by the Veterinary Surgeon, and in this way the work was made more instructive.—E. J. SHELTON.

STOREKEEPER.

The list of books and requisites purchased by the Winter School farmer students includes:—

Farmers' Handbook.
Pigs and their Management.
Book-keeping Exercises.
Field Note-books.
Home Doctoring of Animals, and other works.
Secateurs.

In addition, a large number of bulletins, pamphlets, and diagrams were issued.

Each farmer student was also provided with a complete set (fifty-four) of the score-cards issued by the College.—W. HEADFORD.

POULTRY EXPERT.

During the farmers' session of 1911 I delivered four lectures on poultry; two on bees; one on ostriches; and one lantern lecture. Six students worked eight or ten days learning practical work, and eight attended for lectures and general theory.—D. S. THOMPSON.

SADDLER.

Forty-three students passed through the shop, the majority making various articles for themselves, the others learning to make a thread and do repairs. Several of them bought sides of leather and made them up into various kinds of harness. They were very earnest and attentive workers.

List of work done:—Three bridles; 15 breast-plates; 6 pairs of plough back-bands; 6 pairs stirrup leathers; 12 pairs leggings; 2 pairs spring-cart winkers; 28 coupling straps; 2 sets spider lead harness; 10 saddle girths; 1 pair spring-cart traces; 37 passenger labels.—H. COLLINS.

THE MAGPIE.

MR. A. LANSDOWNE, of Goulburn, commends the action of the Department in advocating the protection of this and other insectivorous birds, and states :—

> The ignorance that exists regarding our birds is as deplorable as their rapid extinction, chiefly caused by the rabbit poisoning craze, which is also responsible for other evils, while bunny thrives better than ever. Why rabbit-poisoning is continued and enforced, in the face of experience and the protests of gentlemen who know whereof they affirm, is a mystery. My late brother, an expert gardener, also the late Dean Sowerby, and others, always encouraged the magpie. For many years I have done the same, as I always found them useful friends, doing scarcely any injury.

FAIR AVERAGE QUALITY OF WHEAT IN NEW SOUTH WALES.

As inquiries are frequently made respecting the F.A.Q. standard of wheat at different periods in New South Wales, the following information will be of interest :—

Year	Standard.	Date fixed.
1898–1899	61 lb.	23rd February, 1899.
1899–1900	61 ,,	23rd ,, 1900.
1900–1901	61 ,,	21st ,, 1901.
1901–1902	61½ ,,	27th January, 1902.
1902–1903	None fixed—drought.	
1903–1904	61 lb.	28th ,, 1904.
1904–1905	59½ ,,	19th ,, 1905.
1905–1906	62 ,,	24th ,, 1906.
1906–1907	62¼ ,,	24th ,, 1907.
1907–1908	62½ ,,	24th ,, 1908.
1908–1909	61½ ,,	22nd ,, 1909.
1909 1910	62 ,,	31st ,, 1910.
1910–1911	62¼ ,,	13th February, 1911.

ERADICATION OF BRACKEN.

THE Hawkesbury Agricultural College authorities are often asked how to eradicate bracken. So far, the Principal has recommended the spiked roller, passing it over and over the bracken so as to break up and injure the soft, succulent stems of the plant running along under the soil surface. In time this kills the ferns. But Mr. Potts considers that the method recommended in the following extract from the *Mark Lane Express*, London, 19th June, 1911, should be worth a test :—

> If the bracken in some districts could be replaced by nutritious herbage it would represent a decided gain to the districts, but the process has been considered too formidable to be undertaken lightly.
>
> The liberal use of basic slag and potash salts has been tried on a small scale with satisfactory results, as the manures by stimulating the grasses have kept the bracken in check.
>
> But the method adopted with success by Lieutenant-Colonel Ferguson-Buchanan evidently offers better prospects of. success. His treatment is "systematic cuttings." He noticed that when bracken was cut down continually its growth became less vigorous each year, and that grass sprang up among the enfeebled bracken. The area cleared on his estate is between 500 and 600 acres, and as the cost has been about £350, he reckons that the expenditure, representing at 5 per cent. only £18 per annum, is a small price to pay for the large area of fine pasturage already established. Clean cutting with a scythe or hook has been the most effective method, and care should be taken to cut below the lowest leaves, which, if left, will go on seeding. Cutting should begin early in the year, and the more the growth of the plant is stimulated by the process, the quicker will be its ultimate exhaustion. Burning and chain harrowing only encourage the evil by manuring and otherwise improving conditions favourable to the growth of the plant.

Harvest Notes for 1911, Hawkesbury Agricultural College.

J. W. HADFIELD, Instructor in Agriculture.*

CONSIDERING the difficulties under which we were working at the beginning of the year, the harvest has been beyond all expectations. Heavy rains during December, January, and February, flooded nearly all the paddocks. This compelled us, for the greater area, to be satisfied with only one ploughing, and in such cases, with no summer fallow. No doubt the lack of such a fallow was largely recompensed by the excellent soaking which the subsoil received; but the land had to dry before ploughing could commence, and under our soil conditions, was not so much benefited as one might at first suppose. Nevertheless, the harvest has been good, and our sheds are overflowing with excellent hay.

The rainfall about Christmas was exceptionally heavy, causing disastrous floods in places. The total from January to the middle of November was 33½ inches, but the amount falling during the actual growth of the crop, amounted only to 11 inches.

Rainfall for Season 1911.

January	12·920	August	3·135
February	5·860	September	2·140
March	3·780	October	1·520
April	1·125	To Mid-November	·150
May	·725		
June	·050	Total	33·685 inches.
July	2·280		

Total fall during growing season (April to middle of November), 11·125 inches.

Methods Adopted.

All the seed is treated with bluestone and lime. We are troubled very little with bunt, but loose smut is evident in places. The greatest cause for anxiety is rust, and this is avoided to a very appreciable extent by growing early rust-resistant varieties, and planting them as early as other conditions will allow. A moist soil for germinating, with a low rainfall during the actual growth of the crop, was largely responsible for the very little damage by rust this year.

The sowing is done with a 15-disc drill. It is claimed by many that, while these drills work perfectly on clean land, on very trashy ground they tend to run over the grass, leaving the seed exposed on the surface. Others again contend that they allow the dry surface soil to fall loosely around the grain, but their advantages, we consider, far outweigh their deficiencies.

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* I wish to gratefully acknowledge the kind assistance tendered me by Mr Cobb, Farm Foreman, in the compilation of these few notes.—J. W. H.

The manure mostly used on the farm is a mixture of equal parts of "blood and bone" and No. 1 superphosphate, applied at the rate of about 1 cwt. per acre. This quantity gives 3·08 lb. of nitrogen, and 20·14 lb. of phosphoric acid. Though the soil has been built up through many years of cultivation, and much added to its natural barrenness, yet the humus content, especially of the sandy soils, is very low. A little slowly available nitrogen has a marked beneficial effect on the crop, and is found profitable. The benefit from the superphosphate is more marked on the early growth, whereas the "blood and bone" extends its action to a later stage.

Firbank Wheat on the River Farm, 1911. Yield: 2 tons 6 cwt. hay per acre.

Reaper and Binder at work.

All harvesting is done with the reaper and binder. With such favourable weather during haymaking as the last two years have afforded us, we could very profitably grow larger areas for grain, but the atmospheric conditions are too moist, and the ripening too uneven, ever to permit the use of a harvester.

Growing for hay, as has been done in the past, the black oat causes little or no trouble. It is in the paddocks, however, and would need little encouragement to establish itself, were more grain crops grown.

One of the worst weeds evident in the paddocks this year is "Cats' heads" (*Emex australis*). It is sometimes erroneously called "Caltrops," but is somewhat different from the true Caltrops (*Tribulus terrestris*), described by Mr. Anderson in the *Gazette* for May, 1910. It germinates here in the autumn, and produces seed about October and November, when harvesting is in full swing. The seed is about half an inch across, and possesses three very hard, sharp spikes. When growing in the crop it tends to run up, rather than creep in its natural position, and much of it is thus bound up in the sheaves during harvesting. Once these seeds gets into the chaff, the horses suffer in consequence, while those which remain on the ground not only make a second crop inevitable, but may injure the feet of stock, principally sheep.

Stooking.

Altogether a little over 350 acres were sown this year, and utilised for grain, hay, or grazing. Included in this are 33 acres of wheat grown on the flats of the River Farm, situated 3 miles away from the College.

The 350 acres comprised the following paddocks, the yield from which, together with all other data, can be seen in the accompanying table.

HAWKESBURY AGRICULTURAL COLLEGE, HARVEST, 1911.

Crop.	Paddock.	Area.	Variety.	Seed Sown per Acre.	Commenced Planting.	Manure	Utilized for	Commenced Harvesting or Grazing.	Yield per acre
		acres.		lb.					
Wheat	Glebe ..	15	Warren	90	4 May . .	No. 1 super., 50 lb. B. and B., 50 lb.	Grain .	20 Nov. ..	22 bushels.
,, ...	,, ...	16	Nutcut	90	6 ,,	,, ,, ...	,, . ..	7 ,, ..	19 ,,
,, ...	,, ...	18	Cleveland	90	9 ,, .	,, ,, ...	Hay	14 ,, ..	2 tons.
,, ...	,, ...	14	Bunyip . ..	90	11 ,, ...	,, ,, ..	,, ...	25 Oct. ..	1 ton 5 cwt.
,, ...	,, ...	7	Firbank	90	13 ,, .	,, ,, . .	Grain	9 Nov. ..	24 bushels.
,, ...	No. 6	75	Warren .. .	60	3 April ..	,, ,, .	Hay .. .	7 Oct. ..	1 ton 5 cwt.
,, ...	River Farm ..	31	,, ...	75	18 ,, ...	No manure	,, ...	7 ,, ...	2 ,, 8 ,,
,, ...	,, . .	2	Firbank . .	75	27 ,,	,, . .	,, ...	25 ,, .	2 ,, 6 ,,
Oats	Clarendon .	115	Algerian	104	5 June	Super., 50 lb. . B. and B., 50 lb.	,, ..	4 Nov.	1 ,, 5 ,,
,,	No. 5 . ..	15	,,	107	3 July	,, ,, ..	,, ...	25 ,, ..	18 cwt.
Rye ..	,, .	5	Emerald ..	78	30 June..	,, ,,	Grain ..	25 ,, ..	22 bushels.
	,, . ..	5	Giant	78	30 ,, .	,, ,, ...	,, . .	25 ,, ...	22 ,,
	,, ...	5	Black Winter .	78	30 ,, . .	,, ,,	,, ...	25 ,, ...	22 ,,
Mixtures ..	No. 2	14	Cape barley ... . Rape	45 8	20 Mar.	Super., 30 lb. . B. and B., 30 lb.	Grazing sheep ...	June.	......
,, ...	No. 2 Piggery	8	Skinless barley . Rape	56 8	2 May .	Super., 50 lb. . B. and B., 50 lb.	Grazing pigs ...	August.	......
,, ..	No. 3 ,,	8	,, ,,	56 8	3 ,, ..	,, ,, .	Grazing cattle ...	,,	.....
,, .	No. 4 ,, .	9	Barley . Vetches	60 30	3 ,,	Super., 56 lb. .. B. and B., 56 lb.	Grazing sheep ...	,,	.. .
,, ...	Calf Paddock ..	6	,, ,,	67 30	17 ,, ...	,, ,, ...	Grazing cattle ..	,,	......

Varieties of Wheat.

Some notes on the above may not be out of place, but it should be borne in mind that the conclusions drawn may only apply to our conditions and methods of cultivation.

Warren.—This variety has proved itself very rust-resistant, and well adapted to the Coast. It seems more consistently rust-resistant than Thew, and does not vary so much with the seasonal conditions. It is not very early, produces a fair amount of good coloured leaf, but is perhaps inclined to be a little harsh in the straw.

Thirty-one acres of this variety were grown on the river flats. The soil is rich and low-lying, both conditions conducive to rust; yet the 74 tons of hay harvested from this area was perfectly clean.

Loading by Students in the Final Examination, 1911.

Thew.—Thew will beat Warren in earliness, which is always a point in its favour. Their power of evading or resisting rust is about equal, but during the four or five years Thew has been grown here it has shown great variation in this respect. On the Plots the early sown Thew was cleaner than the late sown. This inconsistency caused Mr. G. L. Sutton to call it a rust-avoider rather than a rust-resister.

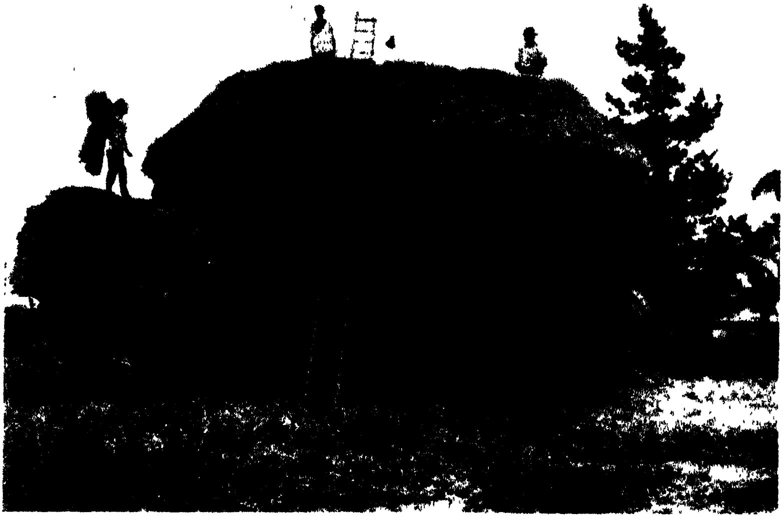
Under good conditions the crop is inclined to lodge. The hay is not of the best quality, being rather harsh, but it possesses good colour, and produces very little dead leaf.

Firbank.—This has been very clean this year, though rust was present in moderate quantities on 2 acres grown on the River Farm. It is very early, and a good hay wheat, but not such a good rust-resister as Warren. The growth is erect and very even, while the stooling is sparse, producing only a moderate amount of leaf. The hay is softer than Thew or Bunyip, being about equal in this respect to Warren.

Seven acres were allowed to ripen for grain, and gave a good crop, yielding about 24 bushels per acre. It was almost perfectly clean, but the straw was very brittle, and much grain was lost before and during harvesting by the stalks breaking off at the first joint.

Cleveland.—This probably comes next in value as a hay wheat. It is very late, and planted at the same time as Firbank, had only just flowered when the latter was ready to cut for grain This may to a large degree be the cause of its liability to rust. The large amount of foliage produced is a healthy dark-green, and the hay produced is also of such good colour that the presence of a little rust can be ignored. As a hay variety, its value lies not only in the yield but in the colour, the absence of dead leaf, and the softness and excellence of the hay and resulting chaff.

It would be found valuable on such a farm as this for early planting in March, continuing with the earlier varieties, and perhaps ending up with Algerian oats.



Stack-building.

From our experience here, these four varieties are to be strongly recommended for trial along the coastal areas, or in other localities where rust is liable to cause damage. The first three are good rust-resisters, while Cleveland deserves its place for reasons already enumerated.

Small areas of Nutcut and Bunyip were also grown. The former is certainly a rust-resister, but produces very little bulk in comparison with other varieties. For this reason it will not be grown to any extent in the future. Even this year only 16 acres were sown, all of which was allowed to ripen for grain.

Bunyip is rather a short grower, and of all the varieties grown produces the harshest hay. It is said to be rust-liable, but is usually ready to cut for hay before rust makes its appearance. Maturing as it does so rapidly, later planting should suit it best, but, on the other hand, later planting will subject it more to the danger of rust-infection.

Oats.

Undoubtedly the Algerian oat succeeds best here, as it does in most parts of the State. It is very rust-resistant, and this in itself puts it far in advance of any other for growing on the coastal areas

The hay is fine and sweet, but is lacking in good colour, and it does not produce such good quality hay and chaff as well cured wheat.

There were 130 acres of Algerian grown, averaging a little over 24 cwt. per acre of hay.

Speaking generally, the oats in the district fared rather poorly. The Clarendon paddock, of 115 acres, received only one ploughing, and no fallowing, owing to the heavy rain. This, in itself, may have largely been the cause of the lessened yield. Further, a spell of intermittent rain falling when only a portion had been carted in, considerably impaired the quality.

Rye.

Nearly every year a few acres are grown, the grain for pig feed, and the straw for various purposes on the farm. It usually does well on our sandy soils, and in parts of the orchard, where the greatest difficulty is experienced in growing anything between the trees, rye has given the greatest yield of any green manure tried.

In its way it is a valuable crop to grow. It is very much relished by stock when young, and the grain and straw from a small area could be very profitably used on most farms.

Mixtures.

The most effective winter mixture is undoubtedly rape and barley. It has been praised by many authorities, and our experience here fully bears out their statements as to its value to sheep, and the after effect on the soil.

Skinless and Cape barley are mostly used with the rape, though rye is a good substitute, and the seed is mixed before sowing. Several small paddocks were sown, and in every case the growth of the barley far exceeded that of the rape.

Where barley and tares were grown, the barley grew so strongly and the tares so poorly, that a casual observer would have never discerned the latter.

The rape takes longer than the barley to become established, and by the time the latter is ready to feed-off for the first time, the rape has hardly a sufficient stand. This may be largely due to the poor soil, but it is certainly one of the disadvantages which the mixture possesses under our conditions.

Besides cattle and sheep, pigs were grazed on one of the mixtures, receiving only water in addition. They had the run of an adjoining grass paddock, and thrived exceptionally well.

Field Experiments with Wheat.

COWRA EXPERIMENT FARM.

F. DITZELL, Acting Manager.

EXPERIMENTS Nos. IX AND X.

THESE two experiments are worked together in the one series of plots. They are also worked conjointly with Experiments Nos. V and VII.

EXPERIMENT IX: *Object*—To determine whether it is advisable to re-plough land just prior to planting wheat.

EXPERIMENT X: *Object*—To determine, when a two-course rotation is practised, the relative advantages of winter and summer fodder crops and a bare fallow for preceding the wheat crop.

These experiments require two blocks, each of 10 plots, the blocks being planted alternately. The plots in each block are arranged and treated in the manner shown in Sketch A.

A comparison of the results obtained from each plot will furnish information as to the benefits, if any, obtained from the growth of winter and summer fodder crops, bare fallow and re-ploughing before planting the wheat crop.

WHEAT EXPERIMENTS Nos. IX AND X, COWRA EXPERIMENT FARM, 1908, 1909, AND 1910.

These experiments have been carried out in accordance with the above general directions.

Rotations and Cover Crops.

A two-course rotation is practised, embracing wheat in alternation with either winter or summer fodder crops or bare fallow. Sketch A shows how each plot is treated.

The cover crops grown have been as follow :—

1908.—Rape the winter crop, and cowpeas the summer crop.
1909.—Tares the winter crop, and cowpeas the summer crop.
1910.—Rape the winter crop, and cowpeas the summer crop.

These fodder crops were never fed-off as a whole, but were almost always ploughed in ; in a few instances the plots were fed-off separately.

Blocks required.

Two blocks are in use, namely, BI, which was cropped with these experiments in 1909, and GVII, which was cropped with these experiments in 1908 and 1910.

Treatment of Land Prior to Planting.

The land was cleared and broken up in 1905 in BI, and 1906 in GVII, and prior to the commencement of these experiments the land was cropped as follows:—

BI: 1905.—This block was planted as a whole for first planting with Schneider wheat.

1906.—A crop of tares was sown, the various plots being manured as follows:—

1. No fertiliser.
2. Sulphate of ammonia, 60 lb., and superphosphate, 90 lb. per acre.
3. Superphosphate, 90 lb. per acre.
4. Sulphate of potash, 30 lb. per acre.
5. No fertiliser.
6. Sulphate of ammonia, 60 lb. per acre.
7. Sulphate of ammonia, 60 lb., and sulphate of potash, 30 lb. per acre.
8. Superphosphate, 90 lb., and sulphate of potash, 30 lb. per acre.
9. Sulphate of ammonia, 60 lb., superphosphate, 90 lb., and sulphate of potash, 30 lb. per acre.
10. No fertiliser.

1907.—Comeback was sown on the various plots at the rate of 42 lb. per acre, to which fertilisers, complementary to those sown with the preceding crop of tares, were applied. The various plots were also treated in different manners, as follows:—

Plots 1, 4, 5, 7 and 10 were treated in the ordinary manner, namely, the tares were ploughed under in the spring, and then the plots were cultivated as necessary until planting time.

Plots 2, 3, 8 and 9 were each divided into two sub-plots, (*a*) and (*b*), in which (*a*) was disc-cultivated just before planting, and (*b*) was re ploughed just before planting, the former method resulting in a firm seed-bed with just a loose surface and the latter in a loose seed-bed. The different fertilisers used and the results obtained from the various plots, in accordance with the different treatments received, are shown in Table I.

After this, Experiments IX and X were planted in this block, which was in an even and suitable condition for the planting of these experiments, having, as shown above, been cropped uniformly in 1905, and each plot having received a dressing of complete manure during the two years 1906 and 1907.

GVII: 1906.—This block was treated as a whole for first planting, Plover wheat being sown.

1907.—This block was again treated uniformly, tares being sown without fertiliser.

Preparation of the Ground.

The ploughing was always done with a disc plough to a depth of about 5 inches, and in accordance with plans which ensured that the "ridges" and "clean-out" furrows were located on the boundaries of two adjacent plots or in the divisions.

Before ploughing was commenced, the plots were always accurately measured out and pegs placed to indicate the exact position of the "ridges and "clean-out" furrows.

During the period between the harvesting of one experiment crop of wheat and the planting of another, the various plots were tilled and planted as follows :—

As soon as possible after the wheat harvest was completed, in either January, February, or March, plots 1, 4, 5, 6, 7, and 10 were ploughed. Immediately after ploughing the ground was broken down and brought into a proper tilth for the sowing of the winter fodder crops, which were sown in March or April. The winter and summer fodder crops grown are enumerated under "Rotations and Cover Crops." No fertiliser was used on either of these crops.

In June or July plots 8 and 9 were ploughed and reduced to a suitable tilth for the sowing of the summer crops in October.

During August and September the winter fodder crops in plots 1, 4, 5, 7, and 10 were ploughed in, and at the same time the stubble plots 2 and 3 were ploughed. Unless special circumstances, such as excessive weed growth, required otherwise, the ground was always left as ploughed until the succeeding wheat harvest was over. The ground was then cultivated so as to maintain a loose mulch of dry earth 2 to 3 inches deep. The object of this cultivation was to conserve moisture, destroy weeds, and prepare a seed-bed.

In October the summer crop was planted in plots 8 and 9. During a favourable time in the late summer, plot 6 was ploughed, harrowed, and cultivated uniformly with plots 1, 2, 3, 4, 5, 7, and 10.

In April plot 8 was ploughed and plot 9 disced, and then both were tilled uniformly with the other plots.

Planting the Wheat Crop.

Just prior to planting, the block was measured out and pickets were placed to indicate the position of the line, which was in 1908 and 1909 run out by a hand-marker, and in 1910 by a marker on the drill, which the drill wheel had to follow in sowing each plot. In GVII the plots are 975 links long and 16 links wide, to allow of one drill width being sown ; in BI the plots are 500 links long and 29·3 links wide, to allow of two drill widths, *i.e.*, one round, being sown.

The seed for all the plots was then treated uniformly for the prevention of bunt, or "stinking smut," in a similar manner to that required for Experiments V and VII, which see.

The same variety of wheat was sown each year, namely, Bunyip.

The planting was uniform for all the plots, which were all sown at the same rate per acre, namely, in 1908 and 1909, 42 lb., and in 1910, 36 lb. They were also sown at the same regular depth and at the same time, *i.e.*, on the same day.

Fertilisers.

The fertiliser used was always applied directly to the wheat crop. In 1908 it was composed of a mixture of sulphate of ammonia, 60 lb.; sulphate of potash, 30 lb. ; and superphosphate, 90 lb. ; and was applied at those rates per acre. In 1909 and 1910 it was composed of a mixture of superphosphate and sulphate of potash in the proportion of 4 parts of superphosphate to 1 part of sulphate of potash, and was applied at the rate of 36 lb. per acre. The fertilisers were distributed evenly on the plots, the manner of ensuring this being described under experiments V and VII.

After Cultivation and Harvesting.

This was the same as in Experiments Nos. V and VII, which see.

Results.

For explanation of the terms "Natural" and "Percentage" yields, &c., see notes in previous experiments (V and VII).

Table I illustrates the difference due to re-ploughing before planting wheat as opposed to merely cultivating. It will be noticed that in plots 2 and 3 larger results have been obtained from discing than from re-ploughing just prior to planting, whilst in plots 8 and 9 the reverse is the case. An average for the four plots gives the following results:—Disced 97·12 per cent., and re-ploughed 94·12 per cent.

It is therefore seen that there is a slight difference in favour of discing in preference to ploughing. As this is a single experiment, too much reliance should not be placed upon these results. If this experiment were carried out over a series of years, it is only reasonable to assume that, as a compact seed-bed is necessary to obtain the best results from wheat, discing immediately before planting wheat will produce a larger yield than ploughing just before planting, as the latter would result in too loose a seed-bed.

Table II shows the results obtained from these experiments during the years 1908, 1909, and 1910. Taking the "average percentage" yield as a basis for comparison, the following are the results in order of merit:—

(1) In stubble until spring, ploughed in spring, and not re-ploughed before wheat	104·34	per cent.
(2) In stubble until spring, ploughed in spring, and re-ploughed before wheat	101·28	„
(3) In stubble until winter, ploughed in winter, summer fodder crop and ploughed in April for wheat	100·03	„
(4) Winter fodder crop, ploughed in spring, and not re-ploughed before wheat	100·00	„
(5) Winter fodder crop, not ploughed in spring, and ploughed in autumn	97·70	„
(6) Winter fodder crop, ploughed in spring, and re-ploughed before wheat	96·18	„
(7) In stubble until winter, ploughed in winter, summer fodder crop, disced in April for wheat	90·16	„

It will be noticed that the two fallowed plots have given the heaviest yields, but that, after all, there is very little difference between the various plots. It will only be after each plot has been treated for several years in the manner planned out that any reliable results will be obtained.

Sketch A.

Arrangement of Plots.

PLOT 1. *Check.*	Planted with winter fodder crop in autumn. Ploughed in spring. *Not* re-ploughed before planting wheat.
PLOT 2.	In stubble until spring. Ploughed in spring. Re-ploughed just before planting wheat.
PLOT 3.	In stubble until spring. Ploughed in spring. *Not* re-ploughed before planting wheat.
PLOT 4. *Check.*	Planted with winter fodder crop in autumn. Ploughed in spring. *Not* re-ploughed before planting wheat.
PLOT 5.	Planted with winter fodder crop in autumn. Ploughed in spring. Re-ploughed just before planting wheat.
PLOT 6.	Planted with winter fodder crop in autumn. *Not* ploughed in spring. Ploughed in autumn as soon after harvest as conditions are favourable.
PLOT 7. *Check.*	Planted with winter fodder crop in autumn. Ploughed in spring. *Not* re ploughed before planting wheat.
PLOT 8.	In stubble until winter. Ploughed in winter. Planted with summer fodder crop in October. Ploughed in April for wheat.
PLOT 9.	In stubble until winter. Ploughed in winter. Planted with summer fodder crop in October. *Disced,* or cultivated, only in April for wheat.
PLOT 10. *Check.*	Planted with winter fodder crop in autumn. Ploughed in spring. *Not* re-ploughed before planting wheat.

FIELD EXPERIMENTS WITH WHEAT Nos. IX AND X, COWRA EXPERIMENT FARM.

TABLE I.—RESULTS OF EXPERIMENTS UPON BLOCK BI IN THE YEAR 1907.

Variety: Comeback.

Plot No.	Treatment.	Manure.	Yield. Per acre. Computed Bushels.	Yield. Per acre. Average Bushels.	Yield. Natural. Bushels.	Yield. Percentage. Yearly.	Yield. Percentage. Average.
1. (*Check*)	Ordinary treatment	Sulphate of Ammonia, 60 lb. Superphosphate, 90 lb Sulphate of Potash, 30 lb.	32·00	32·00	32·00	100	100
2.	(*a*) Ordinary treatment, disc-cultivated prior to planting.	Sulphate of Potash, 30 lb.	31·5	31·5	32·125	98·1	98·1
	(*b*) Ordinary treatment; re-ploughed prior to planting.	Sulphate of Potash, 30 lb.	27·0	27·0	32·125	84·0	84·0
3.	(*a*) Ordinary treatment; disc-cultivated prior to planting.	Sulphate of Ammonia, 60 lb. Sulphate of Potash, 30 lb.	35·25	35·25	32·25	109·3	109·3
	(*b*) Ordinary treatment; re-ploughed prior to planting.	Sulphate of Ammonia, 60 lb. Sulphate of Potash, 30 lb.	32·5	32·5	32·25	100·8	100·8
4.	Ordinary treatment	Sulphate of Ammonia, 60 lb. Superphosphate, 90 lb.	34·375	34·375	32·375	106·2	106·2
5. (*Check*)	Ordinary treatment	Sulphate of Ammonia, 60 lb. Superphosphate, 90 lb. Sulphate of Potash, 30 lb.	32·5	32·5	32·5	100	100
6.	Ordinary treatment	Superphosphate, 90 lb. Sulphate of Potash, 30 lb.	34·375	34·375	32·68	105·2	105·2
7.	Ordinary treatment	Superphosphate, 90 lb.	34·625	34·625	32·86	105·4	105·4
8.	(*a*) Ordinary treatment; disc-cultivated prior to planting.	Sulphate of Ammonia, 60 lb.	30·5	30·5	33·04	92·3	92·3
	(*b*) Ordinary treatment; ploughed prior to planting.	Sulphate of Ammonia, 60 lb.	32·75	32·75	33·04	99·1	99·1
9.	(*a*) Ordinary treatment; disc-cultivated prior to planting.	No manure	29·5	29·5	33·22	88·8	88·8
	(*b*) Ordinary treatment; ploughed prior to planting.	No manure	30·75	30·75	33·22	92·6	92·6
10. (*Check*)	Ordinary treatment	Sulphate of Ammonia, 60 lb Superphosphate, 90 lb. Sulphate of Potash, 30 lb.	33·4	33·4	33·4	100	100

TABLE II.—RESULTS OF EXPERIMENTS UPON BLOCKS BI AND GVII IN THE YEARS 1908, 1909, AND 1910.

Variety: Bunyip.

Plot No.	Treatment.	Year.	No. of Years	Yield.				
				Per acre.		Natural.	Percentage.	
				Computed Bushels.	Average Bushels.	Bushels	Yearly.	Average.
1. (*Check*) ..	Winter fodder crop	1908	1	13·6	13·6	13·6	100	100
	Ploughed in spring	1909	2	28·9	21·25	28·9	100	100
	Not re-ploughed before wheat	1910	3	30·0	24·16	30·0	100	100
2	In stubble until spring	1908	1	16·1	16·1	14·1	114·18	114·18
	Ploughed in spring	1909	2	30·4	23·25	30·13	100·9	107·54
	Re-ploughed before wheat	1910	3	26·83	24·44	30·22	88·78	101·28
3. ..	In stubble until spring	1908	1	16·1	16·1	14·6	110·27	110·27
	Ploughed in spring	1909	2	34·3	25·2	31·36	112·97	111·62
	Not re-ploughed before wheat	1910	3	27·33	25·91	30·44	89·78	104·34
4. (*Check*)	Winter fodder crop	1908	1	15·1	15·1	15·1	100	100
	Ploughed in spring	1909	2	32·6	23·85	32·6	100	100
	Not re-ploughed before wheat	1910	3	30·66	26·12	30·66	100	100
5	Winter fodder crop	1908	1	16·9	16·9	15·9	106·28	106·28
	Ploughed in spring	1909	2	29·6	23·25	33·4	88·62	97·45
	Re-ploughed before wheat	1910	3	28·83	25·11	30·77	93·66	96·18
6.	Winter fodder crop	1908	1	17·9	17·9	16·7	107·18	107·18
	Not ploughed in spring	1909	2	30·2	24·05	34·2	88·3	97·74
	Ploughed in autumn	1910	3	30·16	26·08	30·89	97·63	97·70
7. (*Check*) ..	Winter fodder crop	1908	1	17·5	17·5	17·5	100	100
	Ploughed in spring	1909	2	35·0	26·25	35·0	100	100
	Not re-ploughed before wheat	1910	3	31·0	27·83	31·0	100	100
8.	In stubble until winter	1908	1	18·1	18·1	17·46	103·67	103·67
	Ploughed in winter	1909	2	33·1	25·6	32·96	100·42	102·045
	Summer fodder crop	1910	3	29·5	26·9	30·72	96·02	100·03
	Ploughed in April for wheat							
9. ..	In stubble until winter	1908	1	14·5	14·5	17·43	83·19	83·19
	Ploughed in winter	1909	2	28·3	21·4	30·93	91·5	87·345
	Summer fodder crop	1910	3	29·16	23·98	30·44	95·79	90·16
	Disced in April for wheat							
10. (*Check*) ..	Winter fodder crop	1908	1	17·4	17·4	17·4	100	100
	Ploughed in spring	1909	2	28·9	23·15	28·9	100	100
	Not re-ploughed before wheat	1910	3	30·16	25·48	30·16	100	100

Some "Points" for the New South Wales Wheat-grower.

DURING the past twelve months the *Agricultural Gazette* has, from time to time, contained results of certain field experiments with wheat, devised by Mr. Geo. L. Sutton, late Wheat Experimentalist of this Department. The objects of these experiments were to obtain answers to certain questions which were the subject of dispute amongst practical men, and upon which pure science was unable to throw much light. Experiments conducted in other countries were likewise of little use to us, on account of the differences in climate and soil.

Upon the opening of the Cowra Experiment Farm in 1906, Mr. Sutton at once arranged for some of these experiments to be commenced and continued for an indefinite number of years. It is only in this way that anything approaching a conclusive result can be obtained in many respects. Shortly afterwards, when appointed to the vacancy caused by the death of Mr. Farrer, Mr. Sutton was enabled to extend most of these experiments to other Farms, so that, by having them conducted in different sections of the wheat belt, even more definite conclusions may be obtained upon questions respecting which the State proves to be uniform, whilst variations which exist may be ascertained.

The action of the Experiments Supervision Committee has raised these field trials with wheat to the level which they are entitled to reach. They have been co-ordinated and standardised, and greater security has been obtained that they will be continued irrespective of changes of staff from time to time. The actual field work is conducted by the experimentalist at each Farm, under the control of the manager, whilst the committee exercises a general supervision, having to approve of all proposals from year to year, and ensuring that departure from the original plans shall only be made when, all aspects being carefully considered, it is found to be in the public interest to make the change. Ultimately it is hoped that some of these experiments will rank with those of Rothamsted, Svalof, Wisconsin, and other world-famous stations, for Australian purposes at least; for whilst the equipment placed at the disposal of the Department of Agriculture, in this lightly populated State, cannot compare with that of any of the stations mentioned, the fact that the trials are conducted in our own climate and on our own soil makes them specially valuable to us.

Results of these experiments up to the year 1910 have now been published. Those for 1911 will appear during the coming year. The writing up of results, and subsequent consideration by the committee, necessarily delays publication. When issued the results are in the form of extended tables;

and it is obvious that the majority of farmers have not fully grasped the significance of these masses of figures. An attempt is, therefore, being made to summarise the results so far published in a simpler form. Conclusions cannot yet be final, as it is impossible to say how far they will be modified by later results. It is felt, however, that farmers should realise exactly what the experiments have shown to date.

The guiding principle in these trials has been to have only one "variant." The meaning is, that one particular point only is under trial in each experiment, and the cultural and other work in all other respects is uniform for all the plots. The practice has been to adopt the best methods of farming known in the district. In one respect—that under trial—the treatment of the plots varies; in all others the plots are treated alike, and in accordance with the best known methods of farming to suit the district.

Mr. Sutton has developed the system of "check plots" to an extent which greatly increases the value of these experiments. No matter how even a piece of ground may be, and no matter how long it may have been treated similarly, there are always differences in the crop which will be grown upon it. These differences arise from circumstances which are beyond our control, and they would injure or even destroy the value of the test unless some means were taken to overcome them. For example, it would be idle to try Federation wheat against Yandilla King if one piece of ground would naturally give 3 bushels per acre more than the other, and this fact was unknown. The method of overcoming this difficulty is to have plots distributed through the block upon which the treatment is absolutely uniform, even in regard to the point being tested. These identically treated plots are called "check plots." The yields on these will differ considerably, and we know that the differences between them are due to something beyond our control. Now, if we have three plots together, Nos. 1, 2, and 3, and grow Federation wheat under the same conditions on Nos. 1 and 3, and the yields are 24 and 26 bushels per acre respectively, is it not fair to assume that the yield on plot No. 2 would have been 25 bushels? We therefore say that 25 bushels is the "natural yield" of plot No. 2; that is, the yield which it would have given if it had been treated as a "check plot." But if we are testing varieties of wheat, the "check plots," Nos. 1 and 3, may be planted with Federation wheat, whilst No. 2, being one of the plots on which the varieties are being tried, may have Yandilla King. Suppose the actual yield of this plot is 27 bushels; its "natural" yield was 25, so that its actual yield is 108 per cent. of its "natural" yield. This figure, 108, is called its "per centage yield," and is very fair for comparative purposes. Plot No. 4 may have Comeback wheat, and as it lies between check plots Nos. 4 and 6, its "percentage yield" may be found to be 106. If so, it is fair to say that, for that district and in that season, Yandilla King was a better yielding variety than Comeback. In practice it is considered sufficient to have every third plot a "check plot," but the calculations of "actual," "natural," and "percentage yields" result in the tables which have to be drawn out, and which must puzzle many farmers, or cause them to "shy" at the article altogether. The reader should look first at the "percentage" column, which contains the figures enabling comparison to be made. If he wishes to see the yield per acre, he should look at the "actual yield" column; but he should not compare "actual yields," because of the differences in the soil.

Now let us see what some of these experiments have shown us up to the end of 1910. Let us also be quite prepared to find that the figures for 1911 will upset some of our conclusions a little, while by 1915 we may find that we were altogether wrong in some important points. That cannot be helped. We do not know what those mistaken points are, and we have to grow our wheat for 1912 in the best way known to us.

1. Depth of Ploughing.

Tests of ploughing at different depths have been conducted at Cowra Farm since 1905, and were also made at Coolabah from 1907 to 1909, when operations were transferred from Coolabah to Nyngan. Results appeared in the *Gazette* for February and March, 1911. At Cowra there are no figures for 1909, as the crops were destroyed by bush-fire.

At both Farms, the depths tried were 4 inches, 6 inches, 8 inches, and 8 inches with subsoiling an additional 2 inches. The trials were made with both mould-board and disc ploughs. The average results have shown a slight advantage in deep ploughing, but it has been very slight. The following were the average percentage yields at Cowra from 1907 to 1910:—

Depth	Mould-board.	Disc.
inches.	per cent.	per cent.
4	98	95
6	100	99
8	104	100
8 and subsoiled.	102	98

At Coolabah, from 1907 to 1909, the following were the average percentage yields:—

Depth	Mould-board.	Disc.
inches.	per cent.	per cent.
4	93	100
6	102	100
8	93	106
8 and subsoiled.	107	118*

* Trenched and ploughed 6 inches deep.

It is easy for the reader to draw his conclusions from these figures. For instance, using the disc plough at Cowra, 6-inch ploughing gives 99, and 8-inch ploughing gives 100. So, if the yield from 6-inch ploughing were

24¾ bushels, 8-inch ploughing would give 25. Would the extra ¼ bushel pay the cost of ploughing the extra 2 inches deep upon an acre? Certainly not. It will also be noticed that deep mould-board ploughing at Coolabah has actually lessened the yield.

Subsoiling, strangely enough, appears to have reduced the yields at Cowra. Several theories might account for this; but the fact is the important point. At Coolabah, however, subsoiling gave considerably better yields. This is a very dry district, and the soil is heavy.

These experiments indicate that at Cowra or Coolabah, 5 to 6-inch ploughing is likely to prove most profitable. How far the conclusion can be applied to other districts must be left to the farmer's own judgment. But it seems to be more important to plough thoroughly than very deeply in growing wheat.

2. Kind of Plough to Use.

As the above experiment was carried out with both mould-board and disc ploughs, we are able to compare their influence upon the yield. The following is a summary of results:—

Cowra, 1907–1910.

Depth	Plough	Percentage Yield
inches.		
4	Disc	95
	Mould-board	98
6	Disc	99
	Mould-board	100
8	Disc	100
	Mould-board	104

Coolabah, 1907–1909.

Depth.	Plough	Percentage Yield.
inches.		
4	Disc	100
	Mould-board	93
6	Disc	100
	Mould-board	102
8	Disc	105
	Mould-board	93

These figures show that, unless the ploughing is to be deeper than 6 inches, either plough can be used without loss, and a farmer should use his judgment as to which will do the work best. For instance, in breaking new land that is not to be fallowed, or for ploughing in weed growth just before planting, the mould-board plough would do the work required better than the disc. But in ordinary farm practice there does not seem to be much advantage in either type of plough.

3. Rate of Seeding.

This experiment is in progress at Wagga, Cowra, Bathurst, and Nyngan Farms. So far, results are only available from the three first named Farms, and for one year only—1910. Consequently no final conclusions can be drawn. Two varieties are being used at each Farm—one a free and the other a scanty stooler. Three different sowings, early, mid-season, and late, are made of each variety. The amounts of seed per acre are what are considered in each district to be thin, medium, and thick respectively. These were at Cowra, 22, 36, and 57 lb. per acre; Wagga, 30, 45, and 60 lb.; and Bathurst, 20, 30, and 40 lb. per acre. Half of each plot was cut for hay and half for grain, so that the effect of the rate of seeding upon both hay and grain yield might be ascertained.

For 1910, as will be seen from July, 1911, *Gazette*, the best all round returns for both hay and grain were received at the Farms from the heaviest amounts tried. This might merely indicate that 1910 was a season which favoured heavier seeding than is the usual practice; or it might indicate that we should increase the amount of seed sown per acre in our general farming. It is only when this experiment has been conducted for a good many years that conclusions can be drawn.

4. Fertiliser Trials.

Experiments aiming at the acquisition of knowledge in several directions connected with the manuring of wheat lands are being conducted at the Farms in the wheat belt. One seeks to know the best fertiliser to use in order to supply phosphoric acid, which is apparently the first of the main soil ingredients to give out under wheat-growing. Superphosphate is generally used for this purpose; it is now on its trial over a series of years with bone-dust, rock phosphate, bone charcoal, and Thomas phosphate. The 1910 results (*Gazette*, October, 1911) do not throw much light upon the question. At Cowra the best yield came from the plot with no manure at all; at Wagga, superphosphate won; and at Bathurst bone-dust and bone charcoal together topped the list, whilst superphosphate gave less yield than when no phosphatic fertiliser at all was supplied. None of these results need be surprising for the first year's test. This experiment must be continued for a great number of years before we can say what is the best means of preventing the gradual exhaustion of phosphoric acid in our wheat lands.

Another experiment is designed to ascertain what simple or mixed fertiliser, if any, must be used when the best rotation known for a district is practised in growing wheat. Rotation of crops keeps up the fertility of the soil and the supply of organic matter, but does it supply all that is required? Does it ensure that the plant-food ingredients in the soil are not being removed faster than they are replaced by decomposition of the rock below? If not, what manure must still be added to maintain the supply of plant-food, so that our farm lands may not become exhausted, as in parts of Asia, Europe, and North America? In the last-named country, rotation of crops has *not* kept up the supply of plant-food, and on lands where good farming has been practised for 200 years exhaustion has become very evident.

Incidentally, it will be ascertained whether it is better to apply the fertiliser to the wheat or to the rotation crop.

In such a trial as this, of course one year's results are of no avail whatever. Those who wish to see the figures for 1910, as well as an outline of the manner of conducting this experiment, will find the information in the November, 1911, *Gazette*.

5. Variety Trials.

These are conducted from year to year at all the wheat farms. Results for 1910 are in the *Gazette* for June, 1911. Variety trials supply information as to the behaviour of different varieties from year to year, and must be studied each season to be of value. They also form an important part of the Farmers' Experiment Plots in various parts of the State. The advantage of the trials at the Experiment Farms is that different times of sowing are tested, as well as the effect of feeding-off early sown crops of each variety. Rotation of crops is also practised. Upon the Farmers' Experiment Plots, it has not yet been possible to obtain all these conditions.

6. Methods of Harvesting.

In this experiment we have results from Cowra Farm for four years, 1907 to 1910 inclusive (*Gazette*, January, 1912). The object is to ascertain which of the three main methods of harvesting has the most beneficial effect upon the next crop. These methods are :— (a) Stripping and burning the straw ; (b) Harvesting with reaper and binder , (c) Stripping and ploughing in the straw. The average farmer, in deciding which method to adopt, considers the matter from the standpoint of economy, with one eye upon the condition of the land when he comes to prepare for the next crop. Hitherto there has been no field evidence to show what effect the condition of the land after harvest may have upon the yield of the next crop.

But there are not only three methods of harvesting ; there are also three methods of growing wheat, viz. : (a) wheat every year ; (b) wheat in rotation with a fodder crop; and (c) wheat alternated with bare fallow. Each method of harvesting is being tested in connection with each method of growing wheat.

The results for the four years, given in January *Gazette*, are very interesting. When wheat is grown every year on the same land, stripping and burning the straw gave 20 per cent. better yields than using the reaper and binder, and 10 per cent. better than stripping and ploughing-in the straw. This would be equal to 30 bushels after burnt straw, 27½ after ploughing-in straw, and 25 after the binder. Whether these differences will be maintained over a number of years is a question which can only be settled with time. At Cowra they held good for four years' continuous wheat-growing.

When wheat was grown in rotation with a fodder crop (rape or tares) the results were different. The best returns again came from burning the straw, but they were only 2 per cent. better than the other methods, which were about equal. A difference of 2 per cent. is negligible, and we may say that for the four years the method of harvesting has had no appreciable effect upon the next wheat crop when a fodder crop is grown first. When a bare fallow intervenes before the next crop, the differences are also very slight. Ploughing-in straw gave an average percentage yield of 104, as against 102 from the binder and 100 from burning straw. We shall not attempt to theorise as to the cause of these differences, because they may not be maintained in later years on the same ground. But the facts are there, and there are no other experiments yet to contradict them. A farmer might well follow the practice of a good judge, who assumes that evidence tendered to him is the truth until such time as other evidence, given in the same way, leads him to doubt it.

Another result is obtained by rearranging the figures obtained from this experiment. It is that no matter what method of harvesting was adopted, the growing of wheat every year has always given the worst yield. Every farmer knows that continuous wheat-growing does not give as good results as rotation of crops, or fallowing, though of course a crop is obtained every year instead of every second year from the same ground. The experiment shows that, for four years at Cowra, none of the three methods of harvesting has been able to prevent the gradual reduction in yield. The other two methods of growing wheat (rotation and fallowing) have given practically equal results under each method of harvesting, the wheat with fodder crop showing a slight advantage in each case, but not sufficient to draw conclusions. But wheat after a fodder crop, when the binder was used, gave 50 per cent. better average yield than wheat every year. This would mean the difference between 30 bushels and 20; and the fodder crop is obtained in place of the wheat crop which is dropped every alternate year. Bare fallowing gave a slightly less yield of wheat. Again, it is dangerous to draw conclusions; but there are so many other results at Cowra Farm which point in the same direction, that the management recommend farmers to adopt the system of growing wheat every second year, the alternate years being devoted to fodder crops fed-off by sheep.

7. Another Manurial Trial.

Each of the blocks used in the above experiment was divided into plots, so as to ascertain the chemical needs of the soil under the several rotations and methods of harvesting, by applying simple and mixed fertilisers. No definite conclusions can yet be drawn. In both bare fallowing and growing fodder crops in rotation with the wheat, the soil has not yet indicated what it needs to keep up its fertility. The difference between manured and unmanured plots is never very great. Rotation of crops has certainly kept up the fertility of the Cowra soil for four years. But it must not be assumed from this that rotation of crops will maintain the land in the best condition for ever. As the years pass by we shall see from these experiments what is required to be added as manure under this system, and we may be in a position to advise Australian farmers how to avoid the pathetic complaint of Mrs. Johnston, of Illinois, to her son* :—

> This little farm is poorer to-day than it was when your dear father and I came here to live and labour. The older fields that your grandfather cultivated are less productive now than when he received them from our generous Government. We change our crops, and sow clover with the oats, and return as much as we can to the land. How can anyone do better than we have done? There were many Dutch farmers settled in New York. They were probably the best farmers among all who came to America from the Old World. I have heard your grandfather explain their use of crop rotation, and they understood well the value of clover and farm fertilisers. But with all their skill and knowledge the land grew poor, and now the very farm upon which grandpa was born is not worth as much as the actual cost of the farm buildings.

On the plots growing wheat every year, however, the value of manuring is very evident. Taking the unmanured "check" plots as representing 100, superphosphate alone has given an average of 125, whilst a complete manure, including superphosphate, sulphate of potash, and sulphate of ammonia, has resulted in an average percentage yield of 140 for the four years, or 40 per cent. better than the unmanured plot. All the figures are given in January *Gazette*, and the reader can study them at his leisure.

8. Re-Ploughing.

Is it advisable to re-plough land just before planting wheat? That is, of course, land which has been fallowed or which has had a rotation crop before the wheat. The point has been tested for three years at Cowra Farm, and the results appear in this issue. There is very little difference between the yields of the plots, but so far the second ploughing has certainly not proved of any benefit as against merely cultivating. In the same connection, the relative advantages of summer and winter fodder crops and bare fallow are being ascertained, so that it will be seen several of these field experiments with wheat will confirm one another in some respects. This article will have served its purpose if it induces more readers to examine the results critically as they become available.

SALE OF ARSENATE OF LEAD.

MR. W. H. SPINKS, Fruit Inspector, recently asked for information as to whether arsenate of lead could legally be stocked by an ordinary storekeeper not holding a poisons license, as in many out-of-the-way villages a chemist's shop is out of the question. The Pharmacy Board of New South Wales have intimated that arensate of lead for spraying fruit-trees may be sold by any person without holding a poisons license, but each packet of the article must be labelled "Poisonous Mixture for the Destruction of Vermin." Moreover, any respectable person in any out-of-the-way village where a chemist's shop is out of the question, will receive a poisons license from the Pharmacy Board on application.

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* 'The Story of the Soil," Cyril G. Hopkins.

Varieties of Wheat Recommended by the Department of Agriculture.

IN accordance with the usual practice, a conference of Departmental officers was held in Sydney on the 17th and 18th January, 1912, for the purpose of discussing matters connected with wheat-growing. One of the objects of the conference was the revision of the list of varieties of wheat recommended by the Department for cultivation.

There were present:—Messrs. H. C. L. Anderson, Under Secretary; G. Valder, Superintendent and Chief Inspector; G. M. McKeown, Manager of Wagga Experiment Farm; R. W. Peacock, Manager of Bathurst Experiment Farm; R. H. Gennys, Manager of Glen Innes Experiment Farm; F. G. Chomley, Manager of Yanco Experiment Farm; M. H. Reynolds, Manager of Cowra Experiment Farm; F. Ditzell, Experimentalist, and late Acting Manager, Cowra Experiment Farm; H. J. Kelly, Overseer, Nyngan Demonstration Farm; J. T. Pridham, Assistant Wheat Experimentalist; and H. Ross and A. H. E. McDonald, Inspectors of Agriculture.

The previous classification of the wheat districts of the State was cancelled, and the following was adopted in its place:—

Classification of Wheat Districts.

1. Coastal (embracing those districts bordering on the coast, and which are specially subject to rust);
2. Northern Tableland (of which Glen Innes Farm is representative);
3. Central Tableland (of which Bathurst Farm is representative);
4. South-western Slopes and Riverina (of which Wagga Farm is representative);
5. Central-western Slopes (of which Narromine, Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative);
6. North-western Slopes (of which Tamworth, Gunnedah, and Inverell are representative);
7. Western Plains (of which Nyngan Farm is representative).

Varieties Recommended.

It was decided that the following varieties of wheat should be recommended for cultivation during the year 1912 :—

A.—DUAL-PURPOSE WHEATS.

Recommended for both Grain and Hay.

Variety.	Period of Planting.	Districts.
Bobs	Mid-season and late	Central Tableland; Western Plains.
Cleveland	Early and mid-season	Central Tableland; North-western Slopes.
Comeback	Late	Northern Tableland; South-western Slopes and Riverina.
	Mid-season	Central-western Slopes.
	Mid-season and late	North-western Slopes; Western Plains.
Genoa	Early and mid-season	Northern Tableland; Central Tableland.
Haynes' Blue-stem	Very early	Northern Tableland.
Jonathan	Mid-season	Northern Tableland.
Marshall's No. 3	Early	Central Tableland; South-western Slopes and Riverina; Central-western Slopes.
	Early and mid-season	North-western Slopes.
Rymer	Mid-season	Central Tableland.
	Late-early and mid-season	South-western Slopes and Riverina; Central-western Slopes.
	Early and mid-season	North-western Slopes.
Warren	Early, mid-season, and late	Coastal.
	Mid-season	Northern Tableland; Central-western Slopes; North-western Slopes.
	Late	Western Plains.
Yandilla King	Early	South-western Slopes and Riverina; Central-western Slopes.
	Mid-season	Western Plains.
	Early and mid-season	Central Tableland; North-western Slopes.

B.—WHEATS FOR GRAIN ONLY.

Not recommended for Hay.

Variety.	Period of Planting.	Districts.
Bunyip	Mid-season and late	South-western Slopes and Riverina; Central-western Slopes; Western Plains.
Federation	Mid-season	Central Tableland; South-western Slopes and Riverina; Central-western Slopes; North-western Slopes.

C.—WHEATS FOR HAY ONLY.

Not recommended for Grain.

Variety.	Period of Planting.	Districts.
Firbank	Mid-season and late	South-western Slopes and Riverina; Central-western Slopes; Western Plains.
Huguenot .. .	Early, mid-season, and late ..	Coastal
John Brown	Early, mid-season, and late	Coastal; Central Tableland.
Steinwedel ..	Early and mid-season .	Western Plains.
Zealand ...	Early	Central Tableland; South-western Slopes and Riverina; Central-western Slopes.

D.—WHEATS FOR GREEN FEED AND SOILING ONLY.

Not recommended for Grain or Hay.

Variety.	Period of Planting.	Districts.
John Brown	Early	Western Plains.
Medeah ..	Early and mid-season	Coastal; Northern Tableland.
Thew . .	Early, mid-season, and late	Coastal; North-western Slopes.

E.—WHEATS FOR FURTHER TRIAL.

The following varieties were selected as being suitable for continued experiments with wheats and manures at the Experiment Farms and in the Farmers' Experiment Plots:—

Variety.	Period of Planting.	Districts.
Bayah .	Mid-season	Central Tableland; South-western Slopes and Riverina; Central Western Slopes; North-western Slopes.
Cedar ...	Early and mid-season	Northern Tableland; North-western Slopes.
Florence .	Mid-season and late .	Central Tableland; South-western Slopes and Riverina; Central Western Slopes; Western Plains.

The following wheats are already recommended as above for some districts. The conference considered them worthy of further trial in the following districts, though the varieties were not yet considered suitable for main crops there:—

Variety.	Period of Planting.	Districts.
Jonathan	Mid-season	Central Tablelands; Central-western Slopes.
Rymer	Mid-season	Western Plains.
Warren	Mid-season	South-western Slopes and Riverina.

F.—WHEATS TO BE GROWN UNDER IRRIGATION.

In experiments carried out by the Department, the following wheats have given the best results when grown under irrigation for hay and green fodder:—

(1) Zealand.
(2) Florence.
(3) Marshall's No. 3.
(4) John Brown.

These experiments are being continued in several districts.

VARIETIES OF OATS, BARLEY, AND RYE RECOMMENDED BY THE DEPARTMENT OF AGRICULTURE.

AT the Departmental Wheat Conference, held on the 17th and 18th January, and attended by Managers of Experiment Farms and Inspectors of Agriculture, a discussion took place as to the best varieties of other cereal crops in cultivation.

OATS.

The following were considered the best varieties of oats:—

Algerian.—For the State generally, and western districts in particular.

Carter's Royal Cluster.—For the Central Tableland only.

White Tartarian.—For the Northern Tableland.

Potato and *Abundance* were also considered good oats.

Red Rust-proof has given remarkable good results in Riverina, and can be recommended for trial in dry districts.

Bathurst Early has proved very successful on the coast, and is recommended for trial on the Northern Tableland. Last year, however, in some instances this oat was inclined to lodge.

BARLEY.

The following were considered good varieties of barley:—

FEED BARLEYS.—*Skinless*—For green winter feed and stock grain in districts with comparatively mild winters.

Cape.—For green fodder and stock grain in the cooler districts.

MALTING BARLEYS.—*Standwell* has proved best at Bathurst Experiment Farm, and *Maltster* has given good results; but at Wagga Experiment Farm the best varieties have proved to be *Kinver*, *Golden Grain*, and *Goldthorpe*, in the order named.

RYES.

Black Winter.—For early winter fodder and grain.

Emerald.—For late feed.

White.—For collar-making.

It was pointed out that ryes are only suitable for cultivation on poor soils, generally in cold districts, for green feed. They are hardly suitable for grain at any time, as the yield is small.

Insectivorous Birds of New South Wales.

[Continued from Vol. XXII, page 948.]

25. Mistletoe Bird.

THIS pretty little bird occupies a place between the honey-eaters, which are partly insectivorous, and the Pardalotes (of which the Diamond Bird is an example), which are purely insect-eaters. The Mistletoe Bird derives the bulk of its food from insects, and it is for this reason that it is included in the list of birds of which we are publishing plates; but it is very fond of the sticky berries of the mistletoe (*Loranthus*), occurring as a parasite upon our native trees. The little bird feeds upon the berries, and distributes the seeds, so that it is undoubtedly an active agent in spreading the mistletoe. There has been much discussion upon the question of whether the bird is the only or the chief cause of the distribution of mistletoe throughout the continent, but it quite obviously plays an important part, because wherever one is found the other may be looked for.

The male only has the scarlet breast, the breast feathers of the female being buff-brown. When moving about amongst the mistletoe, itself a beautiful though perhaps valueless portion of our native flora, the male bird, with its steel-blue coat and scarlet breast, makes as pretty a display of colours as one would wish to see: and the beauty of such a spot in a somewhat sombre landscape should appeal to all to assist in the protection of a little bird, which, being mainly insectivorous, must be of considerable economic value.

The nest is pear-shaped, with a slit-like entrance near the top, and is usually composed of plant-down, held together with cobwebs. It is a dainty little nest, like a lady's bag, swinging on the tip of a slender branch. Any kind of tree may be used for a nesting site. The setting consists of three pure white eggs.

26. Welcome Swallow.

We come now to one of the most homely of all our groups of insectivorous birds—the swallows. They are generally regarded as not of much account; interesting to the children, but on the whole more troublesome than otherwise with their mud nests about the place. We wish to impress upon our readers that swallows are purely insectivorous birds—that is, they derive their whole subsistence from insects. The insects are captured during the graceful flight of the birds, skimming along over the surface of water or land in the way which is so familiar to us. As their flight is so swift as to be proverbial, it can readily be understood, upon a little reflection, that these birds are of immense value to agriculture. They are the scavengers of the air, and their habits should be known to all agriculturists, so that they may be encouraged to come in increasing numbers about home and farm. They destroy millions of mosquitoes, gnats, and small flies, which would otherwise come into the house.

Swallows are migratory birds, spending the colder months of the year in the tropics ; but in Australia many swallows remain during the winter in southern latitudes. The species illustrated in this issue, the Welcome Swallow, or House Swallow, is the most common of all ; and not only do many remain during the winter months, but odd nests may be found in the neighbourhood of Sydney at any time of the year.

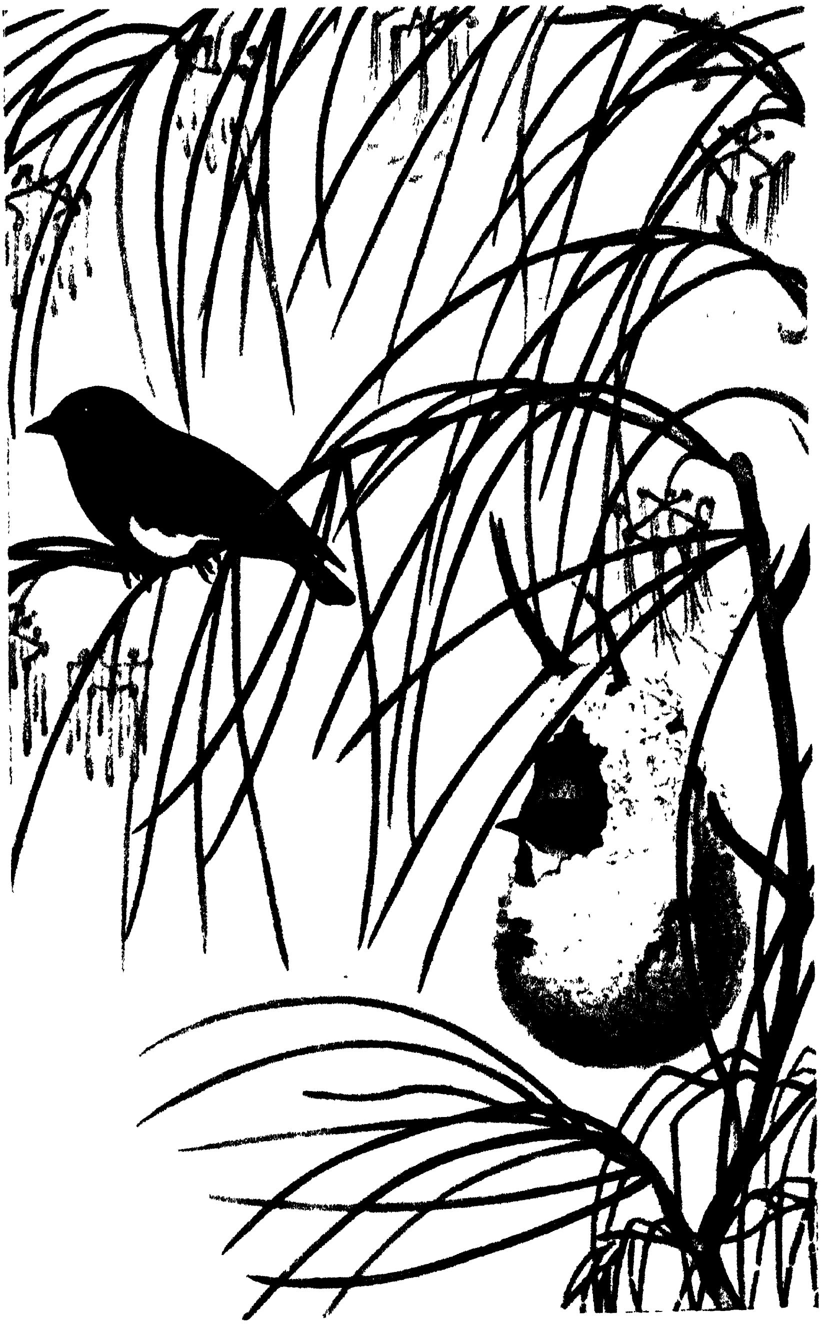
The Welcome Swallow often builds its nest in the most peculiar situations. The frame of a wool-press, the paddle-wheel of a steamer, the inside of a coach, a pannikin hanging in a hut, and the top of a bundle of filed accounts, are amongst the queer situations in which swallows' nests have been found. They will also build in a hollow tree; but they prefer to rear their young about houses, stables or outbuildings, under verandahs, culverts, or bridges, or elsewhere under the protection of man.

Mr. North states that nest-building usually occupies about twelve days; the eggs are deposited daily, incubation lasts fourteen days, and the young leave the nest when eighteen to twenty days old. There are usually four, but sometimes five, young swallows in the nest, and during the three weeks or so that they remain in it, Mr. Hall states that the parents have to visit the nest with food for them every three minutes. The parents appear to take this persistent duty in turns.

Now, suppose there are thirty swallows' nests about a homestead (not an unusual number by any means). Suppose a swallow brings one insect every time it visits a nest, we have thirty insects destroyed every three minutes, or ten a minute, which is equal to 600 per hour. There does not appear to be any record of the length of time per day that feeding continues, but if it is only four hours, there is a daily destruction of some thousands of insects. The sixty adult swallows have also to feed themselves. Perhaps these figures will convince readers that the protection of insectivorous birds is not merely a fad of the Department of Agriculture.

Swallows return to the same position every year to build their nests, repairing the old nest, if its walls are still standing, or rebuilding if it has been destroyed. They are very determined, and will often commence again and again in the same spot when the partially-built nest is wilfully destroyed, as is too often the case.

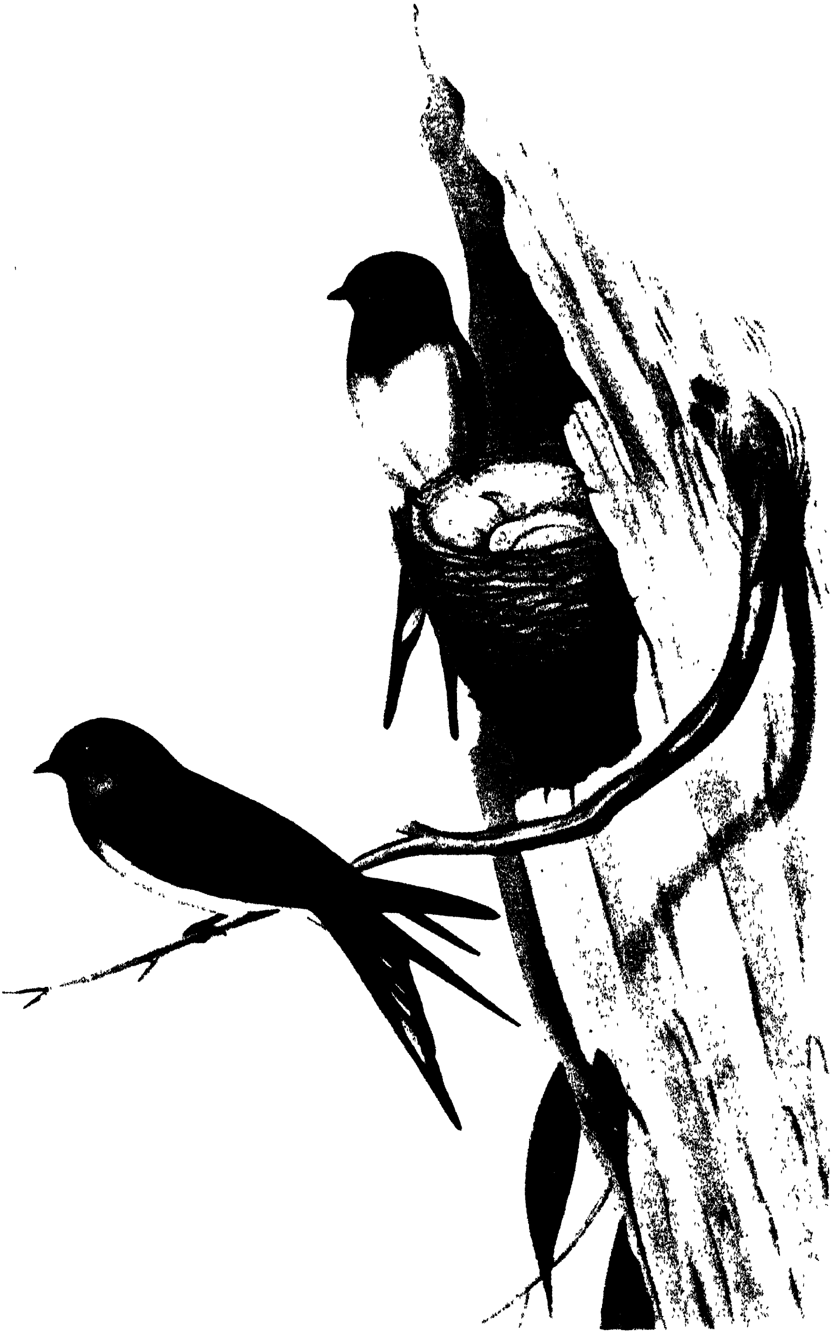
Boys and cats are their enemies, and their very persistence in returning after being disturbed helps them to become an easy prey. Our readers should appreciate the homely swallows at their true worth, and encourage them to return and rebuild year after year upon their farms.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"MISTLETOE BIRD."

Dicaeum hirundinaceum, Gould.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"WELCOME SWALLOW."

Hirundo neoxena, Gould.

Attractive Rural Homes.

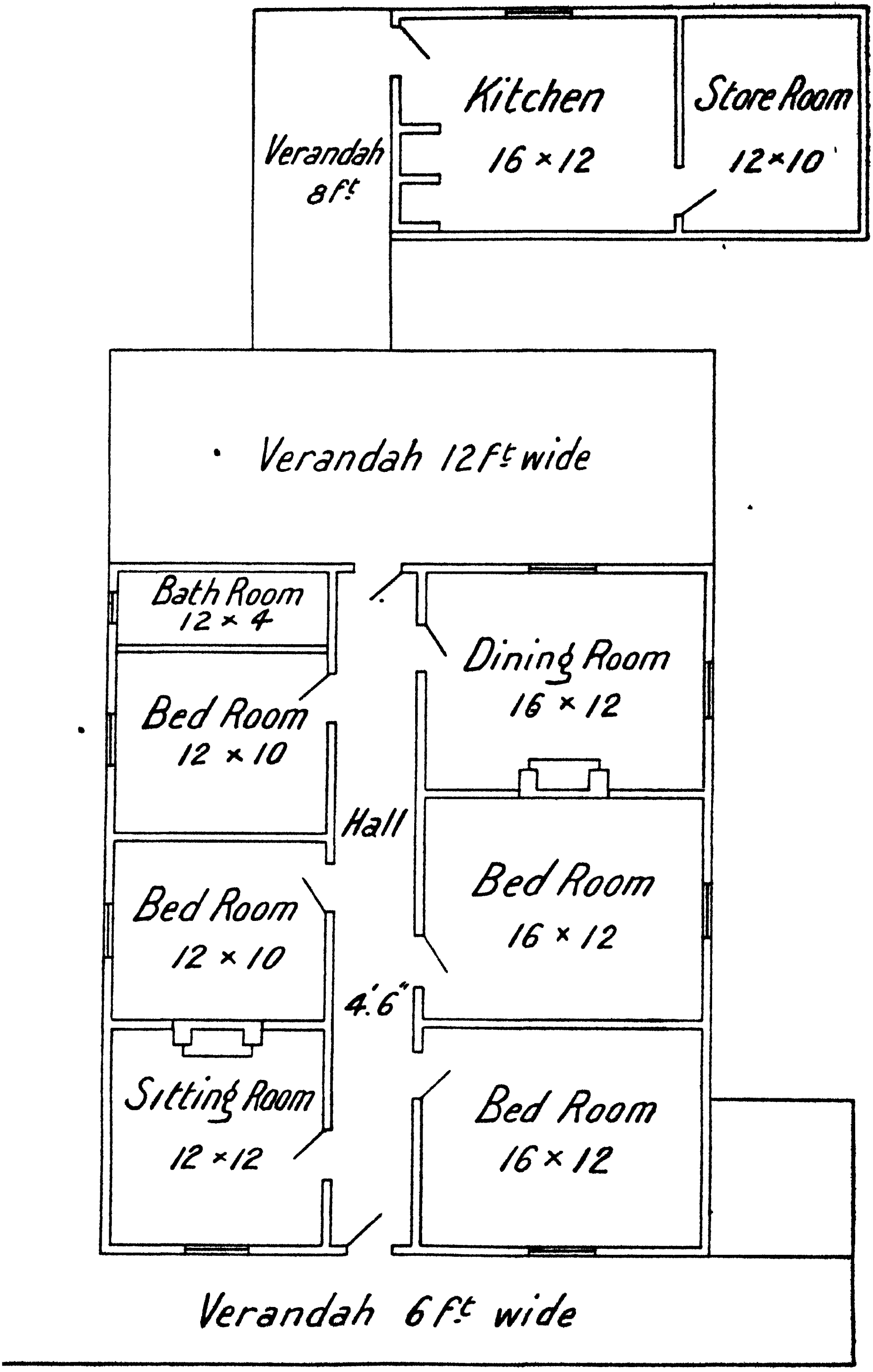
IN response to the invitation contained in November *Gazette*, one or two farmers have sent photographs and ground plans of their cottages, which will be published in their turn. We wish to repeat the invitation now. The Department of Agriculture is desirous of getting together a collection of photographs and plans of attractive cottages, such as the average farmer should be able to build, and it is proposed to publish them in this *Gazette*. Later, they will be compiled into a special pamphlet. The object is to assist other farmers, by suggestion and example, to build homes more in keeping with the state of our agricultural industries. If you have a home of which you and your family are proud, a neat, bright, attractive home, built at reasonable cost, then you are in a position to help your neighbours, through this *Gazette*. Send a photograph of the home to the Department of Agriculture. If you have never had one taken, then it ought to be done. Order a dozen copies from a reputable photographer—they will be handy to send to your friends, amongst whom the Department wishes to be included. The plan need not be artistic—a rough pencil sketch will do, showing the measurements of the rooms, position of doors, windows, fire-places, tanks, and so on. Have a look at the homes which have already been shown. Can you "go one better"? If so, you will be helping others by sending the photograph and plan.

We now give pictures of the homes of two more Hawkesbury fruit-growers. Hawkesbury district has thus three out of the first four homes in the series. This does not necessarily mean that the district easily leads the State in the matter of attractive rural homes; it is due to the local patriotism of Mr. H. A. Wood, Fruit Inspector, who has gone to a great deal of trouble to secure pictures from his district. The Hawkesbury was the cradle of Australian settlement, and Mr. Wood is determined that it shall not be behind in a little matter like this.

3. Mr. George Lamb, Grose Vale.

The faith which our people have in the value of irrigation, as shown in the large sum being spent at Burrinjuck, is not entirely based on the experience of other countries. In many parts of the State, enterprising men have demonstrated it in a small way, and in no branch of rural industry has it proved its worth to a greater extent than in fruit-growing. Mr. Lamb has an orchard of about 30 acres, consisting mainly of citrus fruits and pears, and he irrigates it from a dam in a creek about three-quarters of a mile away. One of the results of his enterprise is the pretty weatherboard cottage shown in the plate.

This cottage contains six rooms, with kitchen and store-room connected to the main building by means of a wide, cool verandah. The inside walls are of lath and plaster. The water supply is obtained from the irrigation main. The cottage should commend itself to those who desire that their womenfolk should have cool conditions for the daily house-work, a provision



Ground-plan of Mr. George Lamb's residence, Grose Vale.

Mr George Lamb's residence, Grose Vale.

Mr. H. E. Peck's residence, Kurrajong Heights.

ATTRACTIVE RURAL HOMES.

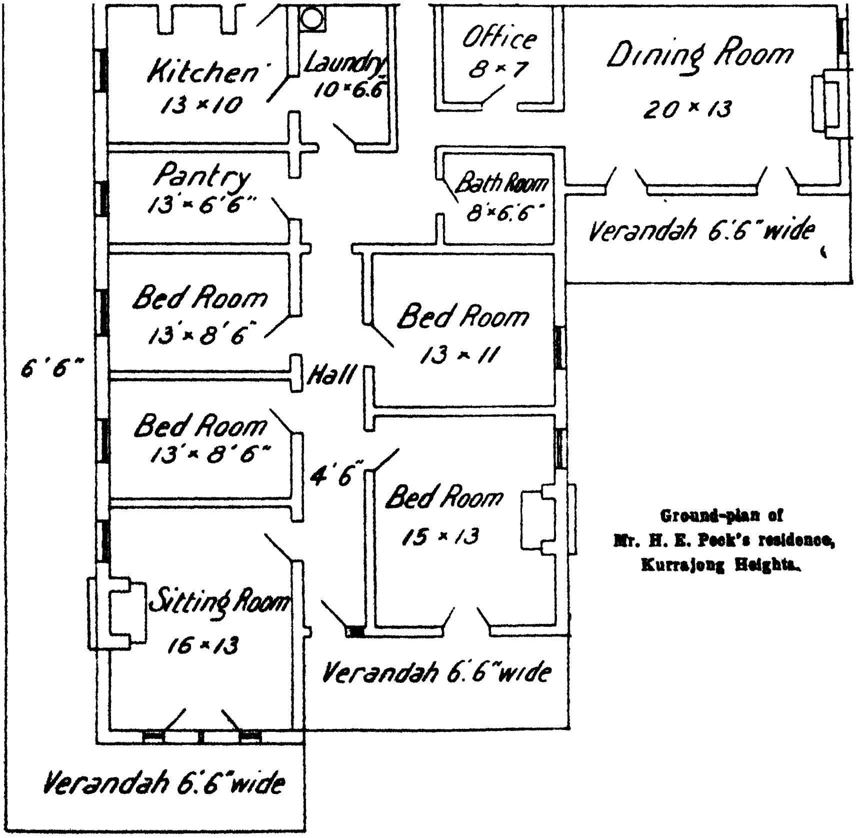
which contributes to greater comfort in most parts of this State. As the immediate surroundings of the house are devoted to vegetables, flowers, and shrubs, Mr. Lamb has certainly provided an attractive rural home, and once again Hawkesbury has "made good."

4. Mr. H. E. Peck, Kurrajong Heights.

This is a more substantial dwelling, built principally of stone, with brick partitions, and steel ceilings. Mr. Peck has a rather large orchard of 80 acres, chiefly oranges, lemons, pears, and apples, but embracing all kinds of summer fruits. He has a number of acres of passion vines growing between young fruit-trees. The passion vines are removed when the trees reach the age of four or five years.

Mr. Peck's home includes the same number of rooms as the one referred to above, but with the exception of the dining-room, the rooms are not so large. Ample ventilation is provided, and the house should be cool. The water supply is obtained by means of a 2-inch pipe from a spring 400 yards distant. The house is surrounded by lawns and terraces of buffalo grass, with beds of ferns, shrubs, and ornamental trees.

The next homes to be illustrated are far away from the Hawkesbury, in both distance and climate.



Ground-plan of Mr. H. E. Peck's residence, Kurrajong Heights.

DESTRUCTION OF LOCUSTS.

THE following spray has been used by the officers of the South African Locust Bureau, and has been found the most effective of all arsenical sprays in use. When the young locusts and the grass or herbage upon which they are feeding have been sprayed with this mixture the locusts die within four days.

Formula.—1 lb. arsenite of soda; 4 lb. treacle or sugar.

Dissolve in a gallon of hot water, and then make up to 16 gallons. This is the strength for the young locusts up to the first fortnight after they are hatched out. After this the water can be reduced to 12 gallons, and later on to 8 gallons. If a kerosene tin is used it can be taken as a measure of 4 gallons.

Stock should not be allowed upon grass or herbage that has been freshly sprayed. The action of the spray is to burn the green grass to a brown tint, when it can be readily burnt off and the arsenic destroyed. A good shower of rain will also wash all poison off the herbage.—WALTER W. FROGGATT, Government Entomologist.

BAG-SHELTER CATERPILLARS AT GILGAI.

EARLY in December, at the request of the local Progress Association, Mr. W. W. Froggatt, Government Entomologist, visited Gilgai, near Inverell, and inspected a large portion of the reserve between Gilgai and Tingha, for the purpose of examining the damage done by Bag-shelter Caterpillars (*Ocinara Lewinæ*) referred to in the *Gazette* for May, 1911. All the cabbage-gum, stringybark, and many of the wattle and native cherry trees were completely defoliated over an area of fully 50,000 acres. The whole country was swarming with millions of these slender, hairy caterpillars, and their silken bags were spun over the branchlets in all directions. The grass was full of them, and every bit of loose bark protected a family of them. The fine spines cast from the bodies when pupating were reported to be all over the bark of the trees, and persons handling wood found the skin of the arms itchy, while a full-grown caterpillar, accidentally crushed on the arm or other tender portion of the skin, raised a regular inflamed blister, like the effect of a nettle.

As the caterpillars both drop from the infested trees on a silken thread, and climb down the trunk, Mr. Froggatt reports that it is useless to bandage the trunks with a view to keeping the pests in the trees whilst they are being destroyed. The chief method of keeping them out of the houses is to cut down the surrounding apple, gum, and stringybark trees.

Mr. Froggatt considers that the only solution of the trouble would be a bush-fire or some parasitic disease.

LIME-SULPHUR WASH AS A SUMMER SPRAY.

AT the present time there is no topic of such general interest in connection with the summer spraying of fruit-trees as that of the use of the lime-sulphur preparations for controlling fungous diseases. Bordeaux mixture has for years been recognised as the only effective means by which the many fungous diseases could be combated. However, there was always the fear and chance of injury, not only to the foliage but also to the fruit. This injury was more particularly noticeable in the case of tender varieties of apples, and in the cooler districts, where the rainfall was frequent and fogs were likely to be met with at the time the application of spray was made. It has been proved beyond doubt that rain following soon after the application of Bordeaux mixture is more than likely to induce russetting of the fruit. In the case of peach-trees sprayed when in foliage with Bordeaux for fungous diseases, it has been found to seriously shothole the leaves.

As is well known, most of our fungous diseases are of greater severity when the weather is moist and muggy, and in low-lying damp situations. This fact, therefore, places the injurious factor beyond our control when using Bordeaux mixture on the stone and pome fruits. The spores of the fungus germinate and infection takes place only in the presence of moisture. Where the fungus disease has got a good hold it will no doubt continue, regardless of any spray that might be applied the day after the rain. This, of course, is a most important point to be remembered, as some growers are inclined to wait until after the rain is over, so that the spray will not be washed off By doing this, the purpose of the application of spray will be defeated.

We have, therefore, been in want of a fungicide that could be applied when it is most needed without causing any injury. So far, our investigations seem to indicate strongly that some form of lime-sulphur preparation will in the near future satisfy this demand. No spraying compound was ever put to so severe a test, and none so strongly condemned, not so much because of its being inefficient as because of its disagreeable features, viz., its odour and its caustic nature. As a winter dressing for deciduous fruit-trees its good qualities are well known, but it is for the summer spraying that we have been so anxious to secure a reliable wash. At Bathurst, Capertee, and Penrose, the commercial concentrated lime-sulphur solution has been used this season for controlling the "Black Spot" of the apple, and, from my observations of the result, I feel confident that this spray has come to stay.

Another feature of great value is the fact that the lime-sulphur can be applied mixed with arsenate of lead, and with excellent results. The concentrated lime-sulphur solution in paste form can be purchased in Sydney, ready made up, it being only necessary to dilute the mixture with water. The advantage of this, of course, is that the grower has not to buy the ingredients, nor prepare them by cooking. The fact of being able to secure the spray chemically prepared in this way, perhaps means the securing of better results from its use, as it is generally known that lime-sulphur is liable to be cooked differently when each vat is prepared.—W. J. ALLEN.

Farmers' Experiment Plots.

WINTER GREEN FODDER EXPERIMENTS, NORTH COAST DISTRICT, SEASON 1911.

G. MARKS, Inspector of Agriculture.

THESE experiments comprised a trial of varieties of wheats, oats, ryes, and barleys, and were carried out on the following farms:—

A. J. Brown	Murwillumbah
A. Burnett	Myrtle Creek
McDonald and Hynes	Glenugie
F. W. Kemp	West Kempsey
F. Longworth	Stewart's River

The object of the experiments is to determine the most suitable crop for providing succulent green fodder during the winter and early spring months. Hitherto the principal crop grown, where provision has been made for winter feed, has been oats. Even the Algerian variety invariably takes rust, and frequently to such an extent that stock discard it altogether. This is probably one reason why no serious attempt has been made in the direction of providing green fodder for the winter months in a wholesale manner.

Owing to the excessive rains of the early autumn, it was impracticable to have the land prepared and the plots sown as early as it was desired, and this lateness was responsible for the indifferent returns given by the barleys. The plots were planted in May and June, and the weights taken in November, when they had reached their heaviest green weight. For feeding purposes, of course, it need scarcely be pointed out that the fodder could have been utilised much earlier.

The results, on the whole, are very satisfactory, particularly those of the Stewart's River plots, where exceptionally heavy returns were obtained. They show that of the many varieties suitable for winter feed, there are those which are admirably adapted for the North Coast, and which, if planted in sufficient quantity, would effectively maintain the returns from the dairy.

It must be admitted that, taking the North Coast as a whole, practically no attention is paid to the maintenance of a green food supply for the winter. The wonderful productiveness of the pastures, with the usually abundant and certain rainfall, has naturally caused too much reliance to be placed upon the pastures, and when a short period of hard or severe winter weather is experienced, the stock suffer accordingly. The past winter was an exceptionally severe one for the North Coast, and large numbers of dairy and other stock perished through starvation, and in localities where plentiful supplies of green feed could have been grown. In other localities the condition of many of the cows became so low that, with the succulent herbage following spring showers, a considerable amount of time elapsed before the animals were able to regain their normal condition; and naturally the milk flow during this period consequently suffered.

The experiments comprised a trial of three varieties of wheat—Medeah, Thew, and Huguenot; two varieties of rye—White and Black Winter; two of barley—Cape and Skinless; and Algerian oats.

Of the wheats, Huguenot undoubtedly takes first place, both in point of yield and freedom from disease. There is a great future in store for this variety for the North Coast dairymen, and it can be successfully cultivated on lands where the climatic conditions do not favour the production of a clean crop of oats. Furthermore, its strong growth renders it eminently suitable for growing in combination with either field peas or black vetches, providing these latter with the necessary amount of support to facilitate later harvesting.

Huguenot wheat and black vetches.
Manured with 1¼ cwt. superphosphate per acre.
Yield: 11 tons 13 cwt. 0 qr. 6 lb. per acre.

Huguenot wheat and grey field peas.
Manured with 1¼ cwt. superphosphate per acre.
Yield 13 tons 10 cwt, 3 qrs. 12 lb. per acre.

Farmers' Experiment Plots, F. Longworth's Farm, Stewart's River.

Thew is a very good wheat, but on all the plots it showed a little rust. It is a particularly good variety for hay, and is very early; but considering the conditions under which it was grown were on the dry side, this variety should not be planted indiscriminately in wet districts or damp situations.

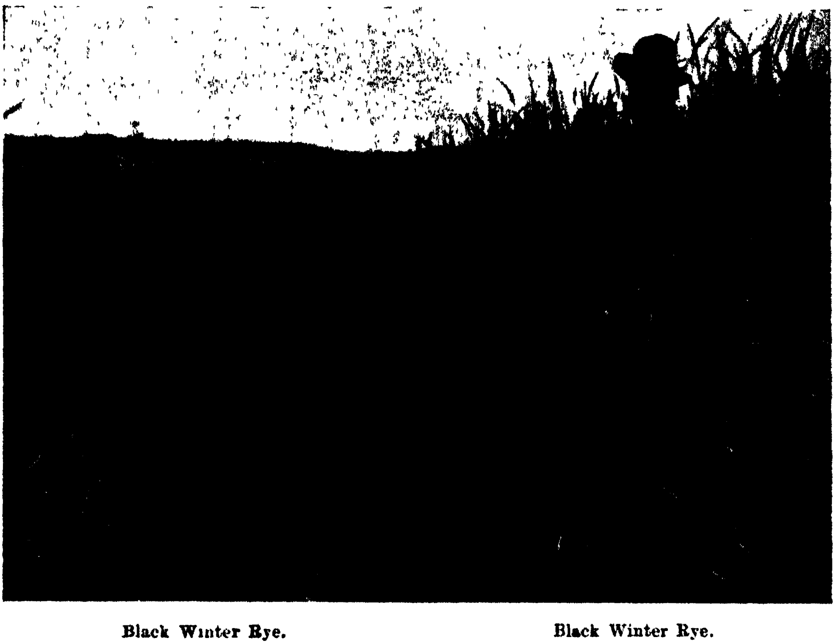
Medeah is a strong-growing variety, but does not come up to Huguenot in point of yield. It is, however, a strong, hardy type, and free of rust.

Four distinct plots were planted with Huguenot, viz., Huguenot, manured with 1½ cwt. of superphosphate per acre; Huguenot, unmanured; Huguenot with field peas; and Huguenot with black vetches. It has long been recognised that the addition of a legume, such as peas or vetches, to a cereal, greatly enhances its feeding value. Grown by themselves they are not easy to harvest on account of their trailing habit of growth, but with such a strong variety as Huguenot the stems provide the necessary support to the legume and enable both to be harvested economically together. In all of the localities where these plots were planted the combination was quite an innovation. The best results were obtained on Mr. Longworth's farm at Stewart's River, where some of the peas attained a length of over 9 feet. On this farm both peas and vetches made a magnificent growth; the wheat stood over 6 feet in height, and nobly supported the dense vine-growth until laid low by a devastating hail and wind storm. The peas appeared to be the more suitable of the two for this locality.

Thew wheat, manured with 1½ cwt. superphosphate per acre
Yield: 9 tons 6 cwt. 0 qr. 24 lb. per acre.
Farmers' Experiment Plots, F. Longworth's Farm, Stewart's River.

The Glenugie and Myrtle Creek plots suffered severely from the dry weather, which set in when the crops were about half grown, and the legumes did not make more than about 12 inches of growth. The wheat plots were planted at the rate of 2 bushels per acre, while the combination plots were planted at the rate of 1½ bushels per acre of wheat and ½ bushel of peas or vetches.

The only oat experimented with was Algerian, all the other varieties being too liable to rust for the humid conditions of the North Coast. Four plots of these were planted as follows:—Algerian, manured with 1½ cwt. of superphosphate per acre; Algerian, unmanured; Algerian, with field peas; and Algerian with black vetches. The rate of seeding was the same as for the wheat plots. It was found, however, that on account of the free-stooling proclivities of the oat, it did not afford the same support as the wheat, and was laid low at the Stewart's River plots at an earlier stage; but on both the wheat and oat plots this only occurred on the manured portions, where the weights per acre exceeded 10 tons. The whole of the Algerian oats showed slight traces of rust, though not in sufficient quantity to prevent very fine samples of hay being made. At the same time, most of the oat plots were planted on land that had not hitherto been devoted to this crop. From observations made on the plots, and upon adjoining farms, where small areas were devoted to oats that had badly rusted, and where such areas had been cropped the previous year with oats, it is quite evident that if a proper rotation system were adopted, it would go a long way in the direction of minimising some of the damage caused by the disease.



Black Winter Rye.
Unmanured.
Yield 5 tons 13 cwt. 2 qrs. 0 lb. per acre.

Black Winter Rye.
Manured with 1½ cwt. superphosphate per acre.
Yield 10 tons 10 cwt. 3 qrs. 4 lb. per acre.

Farmers' Experiment Plots, F. Longworth's Farm, Stewart's River.

Of the ryes, there does not appear to be much to choose between the varieties, but if anything the Black Winter variety is the better of the two. The ryes at Glenugie and Kempsey made but poor spindly growth, and no weights were taken.

The barleys were disappointing, but were planted too late in the season to do much good.

Vermin, consisting of bandicoots, crows, parrots, and bullfinches, did considerable havoc to the plots shortly after planting, and later to the crops as the seed was developing, at Kempsey, Myrtle Creek, and Murwillumbah.

Fertiliser Trials.

In all the fertiliser trials, with the exception of wheat at the Myrtle Creek plots, which were interfered with by vermin, there was a substantial increase due to the fertiliser. Considering the variety of soils and conditions, the results were remarkably regular, ranging from 50 to 100 per cent. increase. Exceptionally good results were obtained at the Stewart's River plots, where a portion of each plot was manured with superphosphate at the rate of 1½ cwt. per acre. The increases on the whole of the plots were very uniform. At two farmers' meetings held during their growth, the most sceptical was convinced of the efficacy of fertilisers, and the results when the yields were weighed have amply borne this out. On this farm there is no doubt that the excellent returns obtained have been in no small measure due to the splendid manner in which Mr. Longworth works his land, thus enabling the fertilisers and the soil to be in the most favourable condition for healthy plant growth.

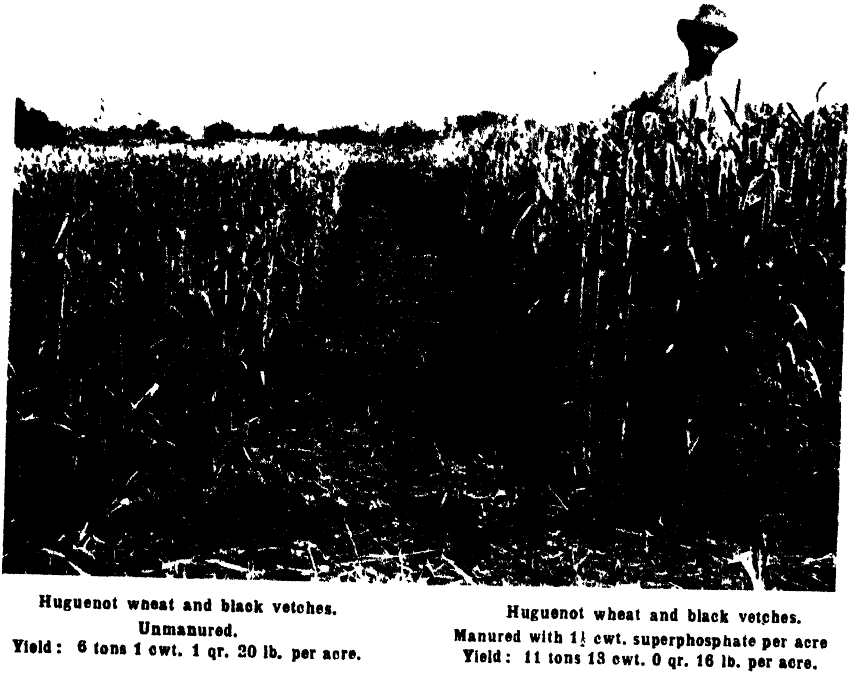
As a direct result of these fertiliser trials, where the difference due to the fertilisers was noticeable from shortly after germination until harvest, quite a number of farmers in this district have decided to manure their crops, and up to the time of writing several tons of fertilisers have arrived in the district for the purpose.

At this stage it would not be out of place to give a word of warning regarding the use of fertilisers. While the experiments have demonstrated the value of fertilisers, there is an erroneous impression amongst certain individuals that it is only necessary now to apply a manure in order to receive a corresponding increase, and that without proper preparation of the soil. In the course of travelling and visiting farms, the writer saw instances where land covered with dense weed growth was ploughed once, and badly at that, manure applied, and maize sown. The young maize gave every indication of producing a very inferior crop, and there was no evidence of increased or improved growth due to the fertiliser. The soil was naturally sour, and the conditions were not promoted whereby the nitrifying and other soil organisms were able to do their work in breaking down inert plant-food and rendering it available for the use of plants. In order that fertilisers may do their part, it is absolutely essential that due regard be paid to the proper and thorough preparation of the soil beforehand.

From careful observations made, it is evident that fertilisers will make a big difference in the future in the returns from the North Coast farms,

Algerian oats.
Manured with 1½ cwt. superphosphate per acre.
Yield: 11 tons 4 cwt. 1 qr. 6 lb. per acre.

Algerian Oats.
Unmanured.
Yield: 5 tons 10 cwt. 0 qr. 4 lb. per acre.

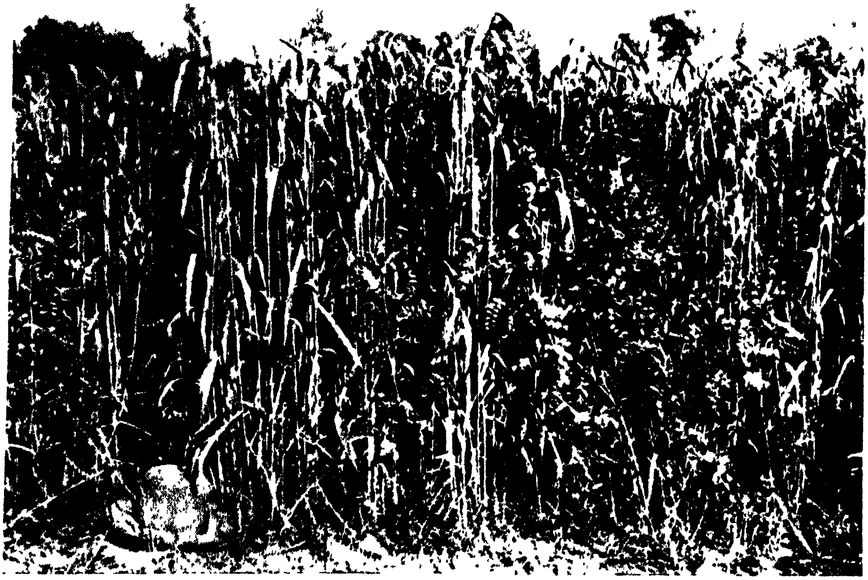


Huguenot wheat and black vetches.
Unmanured.
Yield: 6 tons 1 cwt. 1 qr. 20 lb. per acre.

Huguenot wheat and black vetches.
Manured with 1½ cwt. superphosphate per acre
Yield: 11 tons 13 cwt. 0 qr. 16 lb. per acre.

FARMERS' EXPERIMENT PLOTS, F. LONGWORTH'S FARM, STEWART'S RIVER.

Huguenot wheat and grey field peas, showing how the peas are supported by the wheat.



Huguenot wheat and black vetches, showing how the vetches are supported by the wheat.

FARMERS' EXPERIMENT PLOTS, F. LONGWORTH'S FARM, STEWART'S RIVER.

particularly those which have been farmed for many years without any system of rotation, fallowing, or manuring. The results obtained this season will prove of great value in designing fresh experiments and following up what appears to be a totally neglected branch of North Coast farming.

From a commercial point of view, manuring pays. The cost of 1½ cwt. of superphosphate may be set down as in the neighbourhood of 7s. 6d., and with an expenditure of this sum, an increased weight of from 4 to 5 tons of green-stuff has been obtained.

A further interesting experiment was carried out at the Stewart's River plots in manuring portion of the oats and wheat plots with double the amount of fertiliser, viz., 3 cwt. per acre. On both these plots there was no visible difference in growth, and the weights taken gave no increase. This is interesting as showing that it is very easy to waste manure by applying too large a quantity.

The photographs of the plots were not taken when the maximum growths were made, but at an earlier stage, when the differences and other points were more conspicuous.

WINTER GREEN FODDER EXPERIMENTS, NORTH COAST DISTRICT, 1911.

Variety.	Murwillumbah.				Myrtle Creek.				Glenugie.				Kempsey.				Stewart's River.			
	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.
Medeah	4	14	3	5	5	0	1	25	3	7	1	8	5	6	0	8	§3	2	2	18
Thew	3	0	3	2	*		...		2	11	3	4	2	1	1	0	4	0	1	18
Huguenot (manured)†	6	3	3	24	*3	4	3	8	6	5	1	8	7	13	0	24	10	13	2	24
Huguenot	4	19	2	18	6	6	1	17	3	16	2	16	5	10	0	0	6	11	0	16
Huguenot and field peas	6	13	2	21	5	16	2	20	1	19	1	12	14	16	2	12	6	4	3	11
Huguenot and black vetches	6	14	3	17	5	0	1	25	1	16	1	0	11	13	3	0	6	1	1	20
Algerian oats (manured)† .	8	10	0	17	8	5	1	5	5	11	3	12	5	15	3	6	11	4	1	6
Algerian oats	5	10	2	11	4	17	0	26	2	6	2	12	4	2	2	0	5	10	0	4
Algerian oats and field peas ..	7	4	2	14	4	4	1	2	2	4	2	4	8	1	0	8	4	19	1	21
Algerian oats and black vetches ..	7	18	0	0	4	1	0	3	2	10	3	0	8	16	3	4	6	1	1	20
White rye	5	5	2	26	4	10	3	0		.....				.....			4	13	0	26
Black Winter rye	6	14	3	17	4	10	3	0		.				......			5	13	2	0
Cape barley	3	1	3	26	*		.			....				.				.....		
Skinless barley	4	3	3	12	*					.....				.....				......		

* Partially destroyed by vermin.
† Manured at the rate of 1½ cwt. of superphosphate per acre.
§ Warren variety.

FERTILISER TRIALS.

Manure used: 1½ cwt. superphosphate per acre.

Variety	Murwillumbah				Myrtle Creek.				Glenugie				Kempsey.				Stewart's River			
	tons	cwt.	qr.	lb	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.
Huguenot (manured) ..	6	3	3	24	*3	4	3	8	6	5	1	8	7	13	0	24	10	13	2	24
Huguenot (unmanured) ...	4	19	2	18	6	6	1	17	3	16	2	16	5	10	0	0	6	11	0	16
Algerian oats (manured) ...	8	10	0	17	8	5	1	5	5	11	3	12	5	15	3	6	11	4	1	6
Algerian oats (unmanured)	5	10	2	11	4	17	0	26	2	6	2	12	4	2	2	0	5	10	0	4

* Not comparable; plot damaged by vermin.

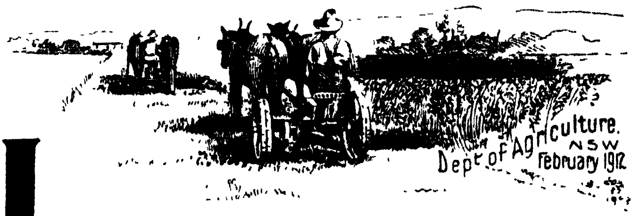
SPECIAL FERTILISER EXPERIMENTS AT STEWART'S RIVER PLOTS.

Manure used: 1½ cwt. superphosphate per acre.

Variety.	Unmanured.				Manured.			
	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.
Warren	3	2	2	18	7	9	0	10
Thew	4	0	1	18	9	6	0	24
Huguenot	6	11	0	16	10	13	2	24
Huguenot and field peas	6	4	3	11	13	10	3	12
Huguenot and black vetches	6	1	1	20	11	13	0	16
Algerian oats	5	10	0	4	11	4	1	6
Algerian oats and field peas	4	19	1	21	10	8	0	14
Algerian oats and black vetches	6	1	1	20	11	18	0	0
White rye	4	13	0	26	9	14	2	8
Black Winter rye	5	13	2	0	10	10	3	4

Note.—Plots of Algerian oats and Huguenot wheat were also manured at the rate of 3 cwt. per acre. There was no appreciable difference between these and the plots where only 1½ cwt. of manure was used.

"THE GREATEST MORTGAGE-LIFTER YET DISCOVERED!"



LUCERNE

PREPARE A CLEAN SEED-BED FOR APRIL SOWING.

LUCERNE AND CORN FOR FATTENING LAMBS.

ANOTHER example of the value of these two great stock feeds in combination is afforded by Bulletin No. 79 of the New Mexico Agricultural Experiment Station—"Alfalfa and Corn for Fattening Lambs." Four lots of lambs, twenty-five in each lot, were fed on lucerne hay, with different proportions of corn added. They were given as much lucerne as they would eat, but the corn supplied was varied, so that Lot I received ¼ lb. shelled corn per lamb per day; Lot II, ½ lb.; Lot III, ¾ lb.; and Lot IV, 1 lb. The test was continued for seventy-three days. The average daily gains in weight were found to be:—Lot I, ·24 lb.; Lot II, ·23 lb.; Lot III, ·28 lb.; Lot IV, ·31 lb. The lucerne eaten amounted to 2·27 lb., 1·91 lb., 1·86 lb, and 1·71 lb. per lamb per day, the lucerne consumed decreasing as the corn was increased.

At the prices ruling there for lucerne and corn, the Station authorities found that Lot I (¼ lb. corn) made the cheapest gains, but Lot IV (1 lb. corn) only cost ·9 of one cent per lb. more, and on a market where shipments are classified, the lambs in Lot IV would probably bring more than one cent per lb. more than those in Lot I, on account of their superior quality.

These proportions of feeds would probably not give exactly similar results in our warm climate, but the principles are the same. Neither lucerne nor corn is a complete feed for stock. To translate the technical expressions of the agricultural chemist, one is a growing and the other a fattening food. There are places in New South Wales where stock are fed on lucerne alone, and there are also places where stock are fed chiefly on corn. Both practices are wrong. These two great fodders should be mixed to suit requirements. Generally speaking, wherever one thrives the other can be grown.

SUCCESS OF NEW SOUTH WALES BUTTERS AT ISLINGTON.

THE Minister of Agriculture is in receipt of a communication from the Agent-General for New South Wales, intimating that at the Dairy Show held at the Royal Agricultural Hall, Islington, on 30th September, 1911, New South Wales butter factories were very successful in the salt butter section. Five entries were received from New South Wales factories, and the first, second, and third prizes were secured by Grafton, Manning River, and Bega factories respectively, the Alstonville factory securing "Highly commended."

In the fresh butter section, the prizes went to Queensland and Victoria, but the Alstonville butter factory received a certificate marked "Very highly commended," whilst four other New South Wales factories were either "Highly commended" or "Commended" for their exhibits. In this section the judge was exceedingly strict on the question of packing, and the results show that exhibits which were in every other way satisfactory lost considerably on "packing" points. He intimates that increasing attention is being paid by the British retailers to the packing of butter, as it is impossible for them to place samples in their windows if evidence of bad packing is apparent.

The Botany of Maize.

(*Zea mays*, Linn. Family, *Gramineæ*).

W. M. CARNE, Botanical Assistant, Hawkesbury Agricultural College.

LIKE all other cereals, maize is a grass; but its peculiar habit of bearing its seed on a cob separates it widely from other grasses. The nearest relative is Teosinte (*Euchlæna mexicana*), from which it is supposed to have originated. Both are natives of America. Maize was introduced into Europe by Columbus, and was so called from "mahiz," the name given it by the people of Hayti. However, it is only during the last century that it has become of great economic importance, and has spread widely through the temperate and semi-tropical regions of the world. It has become the great cereal crop of America, and in that progressive country has been developed and improved marvellously. Varieties have been created for different conditions, increasing the yield; and others have been bred giving an increased production of special products such as starch and oil.

Roots.

As with other grasses the roots the fibrous, and there is no main tap-root. The first roots, those which grow from the germinating seed, are of little importance once the plant passes out of the seedling stage. The majority of the numerous fine roots come away from the stem close below the surface of the soil, though as the plant grows higher, peculiar supporting ones grow out from the lower notches of the stem. When they penetrate the soil these produce a bunch of fibrous roots, and so help to feed the plant as well as keep it erect. Many never develop sufficiently to reach the ground, but are encouraged by hilling the soil around the plants. On account of this peculiar root-growth, the depth of planting the seed has very little effect on the depth of rooting.

Professor King found that when the plants were 18 inches high, the roots of two rows 42 inches apart had met, and had also penetrated to a depth of 18 inches. In the centre between the rows the roots were 8 inches from the surface. At maturity the roots occupied the soil to a depth of 4 feet, and approached to within 4 inches of the surface between the rows.

Stems.

Maize is one of the tallest of grasses, and attains a height sometimes exceeding 18 feet. The stem is jointed, the joints being called nodes, and the portions between the joints internodes. In structure, the stem resembles a cylinder, with a hard exterior packed with pith. It represents a splendid economy of material. With its cylinder formation, strengthened by cross-pieces at the nodes, maize has adopted the most economical method of securing strength with a minimum of woody tissue. Compare the trunk of a tree. The nodes, which reduce the tendency of the cylinder form to buckle under lateral strains, are spaced according to the strength required, being closer together near the roots and wider apart above.

From the nodes grow the leaves, cobs, and branches. Maize tillers, or gives off branches from the lower nodes, as does wheat, but to a much smaller extent. To make room for the cobs and branches, one side of each internode is flattened, and the consequent loss of strength made up by two bands of extra strengthening tissue.

If a young stem is broken, it will almost invariably be found to give way just above one of the nodes. These weak spots are growing places, for each internode grows until it reaches a definite length, determined by its position in the stem. It is owing to this growth, in addition to that made at the top, that maize grows so rapidly. Plants have been known to add 18 inches to their height in a week. It is at this point, too, that the stems, after being blown over by the wind, turn to grow upwards towards the light.

Leaves.

The leaves are arranged in rows, growing one from each node, alternately on each side of the stem. The blade being bent at the middle, directs the rain which falls upon it partly to the extremities of the roots, and partly down the stem to the roots at its base. The leaf-edge develops folds, that portion growing faster than the midrib. The value of these folds in reducing the resistance offered by the large leaves can be well seen in a crop in windy weather.

The sheath strengthens and protects the weak bases of the internodes from dirt and fungus troubles until the stem hardens up. It is helped in this, and in keeping water out, by an outgrowth at the base of the blade called the "ligule."

The rapid growth of maize requires a large supply of water in which to take up the necessary soil foods. The surplus moisture passes out through the leaves. During dry weather the leaves roll up and expose less surface to the drying effects of the sun and wind. It is estimated that a crop yielding 50 bushels per acre requires to use 6½ inches of rain, or roughly 650 tons of water per acre.

Flowers.

The flowers are of two kinds—staminate, or pollen-bearing; and pistillate, or seed-forming. The staminate flowers are grouped to form the terminal tassel of the plant, whilst the pistillate flowers are arranged in rows on a short pithy branch called the cob, and enclosed in husks, or specially developed leaf-sheaths. The cobs are usually found in the axils of the middle and lower leaves. Every plant forms a tassel, but not always a cob, though a plant may have several cobs.

Each small portion of the tassel consists of two staminate flowers enclosed in two dry scales (glumes). Every flower has also two glumes and three stamens, or pollen-bearing organs. The stamens are large, and when ripe they hang out of the glumes, so that the pollen may be scattered by the wind. An average maize plant is estimated to carry 7,200 stamens,

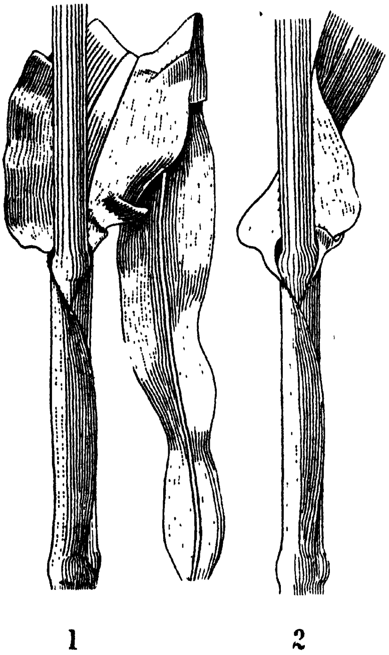


Fig. 1.

1. Maize leaf at rest.
2. Leaf blown by wind, showing how the strain upon the young plant is reduced.

(After Sargent.)

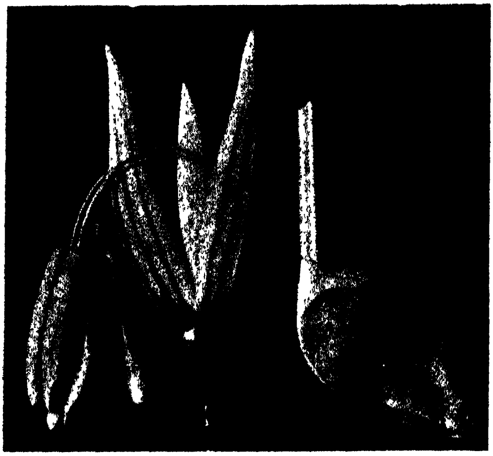


Fig. 2.—Models of Maize Flowers.

On the left, two pollen-bearing flowers.

On the right, a seed-forming flower, the base only of the "silk" shown.

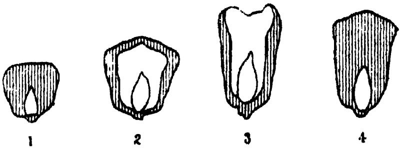


Fig. 3.—Diagrams to show the structure of Kernel in the different races.

1. Pop corn.
2. Flint corn.
3. Dent corn.
4. Sweet corn.

(After Plumb.)

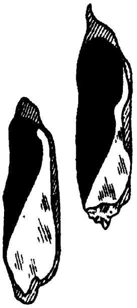


Fig. 4.
Kernels in section.

On the left,
High-oil kernels
(large germs).
On the right,
Low-oil kernels
(small germs).

(After Hopkins.)

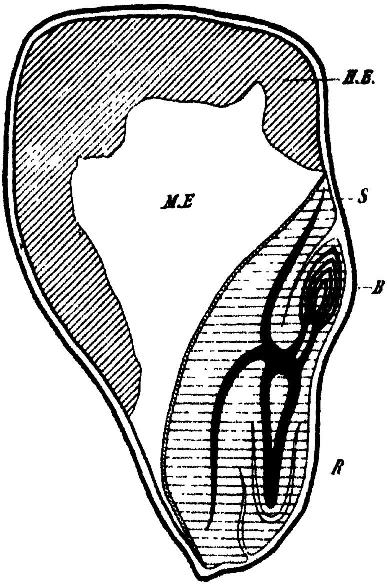


Fig. 5.—Maize Kernel in section.

H.E. Horny protein layer.
M.E. Starchy portion.
Germ { S. Scutellum.
B First leaves of young plant.
R. Root.

(After Frank.)

containing about 18,000,000 pollen grains, as against an average of 2,000 ovules or possible seeds. One pollen grain is sufficient to fertilise and cause each ovule to develop into a seed. As fertilisation mainly depends on the wind, and is in consequence largely a matter of chance, Nature has to make ample provision to bring it about.

The pistillate flowers form double rows on the cobs. Each, instead of three stamens, has a single-seeded ovary (seed vessel), produced at the free end into a long thread-like style (organ for receiving pollen). When the flowers are ready for fertilisation, the styles, generally spoken of as the "silk," protrude through the husks at the free end of the cob. Each thread of the silk is covered with short hairs, which catch the pollen grains floating in the air. Portion of the pollen grain passes down the style, enters the ovary, and unites with the single ovule. The result of the union is that the ovule undergoes changes which convert it into a seed.

In general the pollen comes from neighbouring plants (cross-fertilisation), and not from the tassel of the same plant (self-fertilisation). This is fortunate, because it has been shown by experiment that the yields from self-fertilised maize are much lower than that from cross-fertilised seed. It has its drawback in the difficulty of keeping varieties true, owing to the intercrossing that takes place when several are grown. Nature helps cross-fertilisation by not shedding the pollen except when there is sufficient breeze to shake the stamens and to carry it away from the plants. Against such as does fall directly downward, the silks are protected by the leaves above. When varieties of different colours cross-fertilise, the seeds on the cobs will be found to be variable in colour. An immediate change, such as this, is very uncommon in plants. Variability arising from fertilisation usually makes its appearance in the following generation.

The tassel may commence to shed its pollen several days before the silk appears.

Kernel.

The kernel is a fruit, and not a true seed. It is formed from the ovary, and has two distinct skins, one of which represents the fruit, and the other the seed coverings. The young plant, embryo, or germ, is enclosed in a whitish structure called the scutellum. This is rich in oil, and secretes the enzymes which make the reserve food available for the young plant. This reserve food is in two forms:—

1. A horny, translucent layer, lying next to the skin or hull, consisting mainly of starch, but containing from one-half to two-thirds of all the protein in the kernel. This horny portion really consists of two parts—(*a*) the horny gluten, just beneath the hull; and (*b*) a horny, starchy portion lying beneath it. The two cannot be distinguished by the naked eye. This horny layer is frequently of a red or yellow colour.
2. A soft, white portion, almost wholly starch.

The germ, with the scutellum, contain nearly one-fifth of the protein and four-fifths of the starch, although they do not represent more than one-tenth by weight of the kernel. Since the horny portion contains the most protein, and the germ the most oil, it is possible with the naked eye to compare the relative value of grains in the three food constituents—protein, starch, and oil. A large horny endosperm means a low starch content, and *vice versâ*. In America, by selecting seeds with large embryos, the oil content has been increased to the extent in value of 9d. per bushel. By selecting for the horny layer the protein has been increased by 4 per cent.

Races of Maize.

Maize, though only one species of plant, can be divided into six distinct races, four of which we use in Australia:—

1. Pop Corn (*Zea mays everta*).—The whole of the reserve food is hard and horny. Kernel small.
2. Flint Corn (*Z. mays indurata*).—The horny food store surrounds sides and top of kernel. Kernel usually as broad as long, and rounded and smooth on top. This type makes the best meal (hominy) and maize starch.
3. Dent Corn (*Z. mays indentata*).—Horny endosperm at sides, not covering starchy portion at the top. The top of the kernel is dented and wrinkled, owing to the contraction of the starch inside on drying. This is the most important group, and contains the majority of the cultivated varieties.
4. Sweet Corn (*Z. mays saccharata*).—Endosperm horny, and containing a considerable amount of sugar instead of starch. Kernels wedge-shaped, and wrinkled or shrivelled.

PICKLING SEED MAIZE FOR SMUT.

IN the *Gazette* for August, 1910, Mr. (now Dr.) T. Harvey Johnston strongly recommended the treatment of seed maize with bluestone solution as a preventive against damage from smut. Mr. A. C. Hannabus, of Windsor, who tried the method, now gives his experience as follows:—

> Having noticed for some years the gradual increase in smut in maize in this district, I decided to try the bluestone treatment, as Mr. Harvey Johnston clearly proved that the smut found in this country was distinct from the American maize smut, and could be successfully treated. I used 1 lb. of bluestone, thoroughly dissolved in 5 gallons of water, and only left the seed in the solution sufficiently long to allow of every grain being wetted. I prefer this method as it is the most expeditious. The seed can be dried in a few minutes by spreading it on the floor or a cloth, and will run through the dropper as well as if it had never been treated.
>
> I reduced the number of infested stalks to a minimum. It was scarcely possible to find any smut-infested stalks in a 10-acre patch, planted on 3rd, 4th, and 5th October, 1910, with seed all treated as above. Another plot was planted about the latter end of October, with seed not treated, and in this portion there was an abundance of smut to be found in both white and yellow maize, including two rows of Yellow Dent grown from seed supplied by the Department. I believe fully 30 per cent. of the stalks were smutted.
>
> The vitality and germination of the treated seed were just as good as of the untreated; in fact, I had the best plants all through that I have grown for years, though a considerable portion was destroyed by the flood. Farmers can treat their seed without any fear of loss through the seed not germinating.
>
> Of course, this experiment does not prove in a single year all that is desired, but from what I know and believe, all my seed will be treated as above, before being planted in future.

DRY FARMING AT BOGGABRI.

MR. GEORGE BLACK, M.L.A., forwards the following clipping from the *Boggabri Budget* of 28th November, 1911 :—

As proof that good crops can be raised on even a much lighter rainfall than 8 inches from March to October, we have just received the following facts and figures from Mr. Tout, owner of the Booroomin Estate, near Boggabri. It will be remembered that Mr. Tout acquired the Booroomin homestead block of that subdivision in June last; and just prior to his acquiring this property, an area of 40 acres had been placed under wheat. Mr. Tout has kept an absolutely correct record of the rainfall at Booroomin, from the date of the sowing of the seed up to the time when the crop was ready for the harvester. Here are the records kept by Mr. Tout, who vouches for their correctness :—

Date.	Points.
June 9	10
,, 19	24
,, 20	4
Total	38
July 7	53
,, 8	7
,, 11	33
,, 12	4
,, 14	7
,, 18	12
,, 19	3
Total	119
August 21	62
,, 23	20
,, 24	10
,, 25	23
Total	115
September 3	9
,, 15	10
,, 20	13
,, 21	7
,, 22	35
,, 26	6
,, 29	128
Total	208
October 8	44
,, 15	22
Total	66
Total, June to October	546

Mr. Tout points out that there were some further slight falls between the above dates and the harvest; but he states that this was of no benefit to the grain, which was fully formed and practically ready for stripping at the time.

On Monday and Tuesday, 13th and 14th November, the abovementioned crop was garnered by Mr. F. Studd, with a May Brothers' Climax machine, giving as a result 211 bags of high-class wheat, pronounced by the best judges to be of the best milling quality. This crop, it will be observed, was raised on a rainfall of 546 points, and thus establishes a record of which the owner is naturally and justly proud. The soil from which this crop was raised was, of course, well worked, and the seed was not "scratched" in. It tends to prove that success in wheat-farming, after all, does not depend entirely upon the weather conditions of the locality, but very largely upon the methods of cultivation.

AN EXAMPLE IN KEEPING LEMONS.

ON the 19th December, Mr. W. J. Allen, Fruit Expert of the Department, received from Mr. D. Talarico, "Como," Erina, Gosford, a case of Lisbon lemons, which were picked during the first week in June. The lemons were in splendid condition, and would probably keep for another month under ordinary conditions. If Mr. Talarico can cure quantities of lemons as successfully as he has done in this case, he should be able to supply the market with first-class fruit during the summer months, when it is so badly needed.

Four Hundred Acres of Potatoes.

J. E. O'GRADY.

YES, it is a "big order," but in Millthorpe district the title will not excite any great surprise, because several growers are approaching this area. It is approximately the extent of ground sown with potatoes this year on the property of Messrs. Noonan Bros., who have the Farmers' Potato Experiment Plots for that district. A large section is being farmed on the shares system, but the portion of the joint estate under potatoes this year will reach between 350 and 400 acres. Some notes from the experience of these successful farmers should be of value to other growers, and the public spirit with which the information has been supplied will be appreciated by all.

Millthorpe is a busy township on the Central Tableland, between Blayney and Orange. It is about 3,000 feet above sea-level, and enjoys an average rainfall of 32 inches per annum. This is fairly evenly distributed throughout the year.

A strip of basalt country runs through the district; and it is common knowledge that, next to rich alluvials, basalt gives our best soil. The main crops are potatoes, oats and wheat for hay. In this cool, moist district, the binder and thresher must be used to harvest wheat for grain, and Millthorpe men generally recognise that they cannot now compete with the drier and warmer west, which has become the granary of New South Wales. But those same dry conditions handicap the plains in the production of hay, for which the moist tablelands, wherever the soil is good, are eminently suited.

Millthorpe is "sound." It is a district in which a fair yield is obtained in almost every year; its progress depends upon the development of markets, and the reduction of the cost of cultivation. When the price of potatoes is high, Millthorpe railway station is a busy spot, and as many as 200 draught horses have been counted upon 1 mile of road, drawing potatoes to the railway. Market prices vary in an extraordinary manner at times; but with the wonderful growth of Sydney and other consuming centres, our markets are coming home. Potatoes are a costly crop to sow and to harvest; but the inventors of machinery throughout the world are keeping pace with the increased cost of labour. In years to come, Millthorpe will grow more potatoes and more hay; it will employ more men and more horses; and its net returns per acre will not be reduced.

Our first illustration is a photograph of the Bennett Cup, awarded at Millthorpe Show for the best exhibit of three bags of potatoes—red, white, and blue varieties, respectively. It must be won two years in succession to become the property of the winner. For the first year, 1911, it has been awarded to Messrs. Noonan Bros., for bags of Coronation, Up-to-date, and Brownell's Beauty potatoes. The potatoes exhibited were grown upon the Farmers' Experiment Plots, from seed supplied by the Department of Agriculture. Readers are aware of the nature and purpose of these experiments. The trophy illustrates their value, and also the manner in which they are conducted by Messrs. Noonan.

The Bennett Cup.

Awarded at Millthorpe Show for best three bags of potatoes. Won in 1911 by Noonan Bros., Millthorpe

The rotation practised is to alternate potatoes with wheat or oats. After early potatoes, wheat is sown; after late ones, oats. Only one potato crop can be grown each year, as the danger of frost makes any sowing earlier than November very risky. Wheat is sown in the latter part of March, April, May, or early in June. Oats can be sown as late as September.

Messrs. Noonan Bros. have often grown two crops—potatoes and wheat—in one year. They have grown potatoes, wheat and potatoes, getting three crops in sixteen months. The strength of this basalt soil is very great. Messrs. Noonan bought a piece of land which had grown hay continuously for fourteen years, and they received 1½ tons of hay per acre from it. This is not the usual practice, but it indicates that Millthorpe farmers can grow either potatoes or hay, according to the state of the market; and indeed this is the main factor in deciding what shall be done with the land. Tests of fallowing are being made on a small scale, and Noonan Bros. have 100 acres fallowed for wheat next year.

Ploughing for potatoes is usually done in August. In July the ground is generally too wet; but if it is dry enough, ploughing is commenced at once. Mould-board ploughs are used. As the ground has been long under cultivation, and is clear of stumps and stones, four-furrow gang ploughs do the work, stump-jumps being unnecessary.

After the first ploughing the ground is harrowed; and it is ploughed and harrowed again in September. The seed potatoes are then ploughed in during November.

Sometimes the spring-tooth cultivator is used between the two ploughings, but generally after the second one, the time depending largely upon the growth of weeds.

Noonan Bros. consider that the man who ploughs three times, cultivates twice, and harrows three times, will generally get the best results; but that, if the season should be a wet one, the ground is liable to set after too much working. On the other hand, if the season should be dry, the well-worked ground undoubtedly yields best. The farmer should use his judgment each year. In a wet season it does not matter how rough the ground is left after the plough. Rolling is only practised when it is required to break hard clods.

The old method of sowing potatoes was to drop the seed by hand during the third ploughing. Four-furrow ploughs were used, and two men followed the plough, sowing in the outside furrows. Sometimes a good man could keep up to the plough himself, but the work was very exhausting, as the seed had to be carried. For the past four or five years, the large growers have used a box fastened on the plough to hold seed, and a galvanized iron pipe, into which a man or boy, sitting on the plough, could feed the seed with his hands, the potatoes being dropped in the second furrow and covered by the third sod.

A local workman, after some experience of the task of sowing by hand in hot weather, set himself to invent an appliance to do the work mechanically. The result was the Donohue Potato Planter (patented). The potatoes are fed automatically from a hopper to the bottom of a disc elevator fitted with spring-clasps. As the disc revolves, each clasp seizes a potato, and at the right position is tripped by an iron band, so that the potato falls into a galvanized iron pipe, and is deposited in the third furrow. The planter is driven by sprocket wheels and chain from the land wheel of the plough, and the distance apart of planting can be regulated by varying the sizes

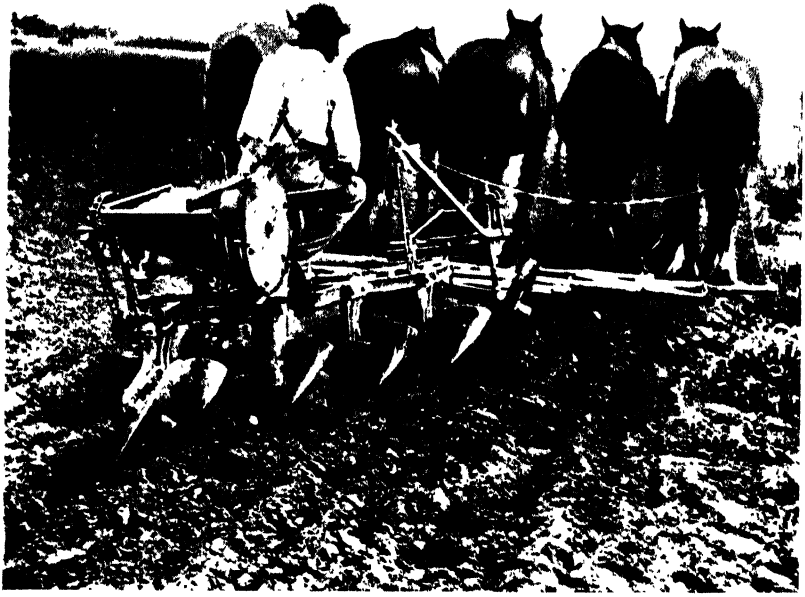
The Method of Yesterday.

Still a common practice in many parts of the State. It usually requires two men to sow potatoes behind a plough.

The Method of To-day.

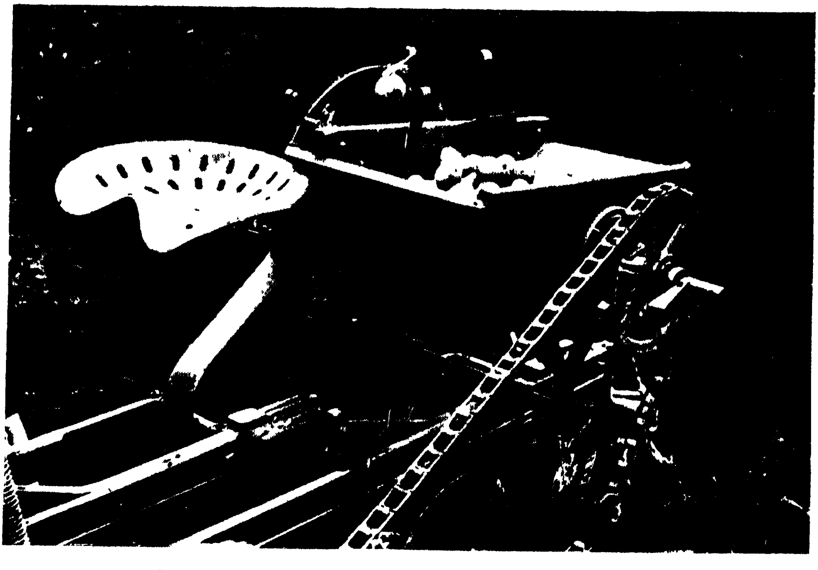
The larger growers usually have a box and chute fitted on the plough, so that a boy can sow as the ploughing proceeds.

METHODS OF SOWING POTATOES.



The Method of To-morrow.

Some mechanical appliance, such as this, will be necessary if our potato lands are to be developed to their full capacity.



The Donohue Potato Planter (Patented), showing construction.

METHODS OF SOWING POTATOES.

of the sprocket wheels. Agitator arms prevent the potatoes from "bridging." The appliance is now on its trial at several farms in the district, and appears to be fairly satisfactory. No doubt improvements will be made in one or two directions, as experience indicates requirements.

In the digging of potatoes, invention has not reached the same stage. There are several mechanical diggers on the market; but what is required is a machine which will lift the potatoes from the soil, clean them of earth, and drop them into bags, just as the harvester does with wheat. Potatoes could then be conveyed straight to the grader—another invention referred to below. One advantage which Millthorpe district possesses is that the ground is fairly clean of stones, so that the unsuspecting public would not be purchasing nice evenly-graded rocks amongst their potatoes. Such a digging machine is not yet forthcoming; but inventors are at work in several parts of the world. When the problem is solved, there will be a demand for the machine on rail at Millthorpe. The present cost of digging varies from 7d. to 1s. per bag, according to the crop. When potatoes fall below £3 per ton, this cost becomes a serious one.

After the potatoes are harvested, the usual practice is to hand-pick them, in order to separate them into market potatoes, seed potatoes, and rubbish. This is another tedious and expensive operation which can be overcome by machinery. For many years it has been customary to grade seed wheat by means of a revolving drum, set at an angle, with perforations of different sizes. The same principle has been applied to the grading of fruit, and it is now to be applied to potatoes. Following the example of a neighbour, Messrs. Noonan have had a large grader made by a local blacksmith, and this will be used in the next harvest. It will be driven by an oil engine, which will also provide the power necessary to elevate the potatoes to the top of the grader.

Messrs. Noonan Bros. have been kind enough to give some figures showing yields of and prices received for their potatoes. Last year they took 22,000 bags from 270 acres. This means an average of 81½ bags per acre, or 5 tons 2 cwt. The area included the Farmers' Experiment Plots.

The prices received during the past five years have been most variable. They have ranged from £1 to £9 7s. 6d. per ton on rail at Millthorpe. During the years 1908, 1909, and 1910, it has paid to hold potatoes back until near Christmas. In 1907 and 1911 it has paid best to sell them immediately they were dug. The seasons cannot account for this extraordinary variation. No doubt the appearance of Irish blight, and the action taken in different States to check its spread, have had a very material influence. Millthorpe has been practically free from the scourge, and when the coastal crops have suffered severely, the demand for western potatoes has raised prices above the normal. The removal of Interstate restrictions has naturally brought them down again, as Sydney is the largest market in Australasia. How far the work of speculators has influenced prices is a point which cannot be dealt with here.

Mr. D. J. Noonan is a vigorous advocate of co-operation in the marketing of potatoes. The idea has been worn threadbare in the press, but in spite of all that has been said and written, in spite of such splendid examples as those afforded by our butter factories and the Mildura fruit-growers, without going beyond the Commonwealth, nothing has been done in the matter of co-operation in marketing farm produce. Old prejudices die hard, and mutual jealousy contributes to mutual loss.

The potatoes are stored in so-called "pits," made by cleaning the ground, tipping the potatoes from the dray, and covering them with 2 feet of straw. Noonan Bros. do not believe in disturbing potatoes which are stored for sale. Turning will certainly prevent them from shooting, but it tends to make them soft. Stored seed potatoes are, of course, picked over and rubbed as required.

The potatoes in the bottom layer of the pit shoot rather badly when stored for a length of time, as they are in contact with the ground. A certain amount of loss occurs from this cause, but it indicates the truth of the opinion that stored potatoes should not be covered with earth at Millthorpe. Besides encouraging the potatoes to shoot, Messrs. Noonan consider that such a practice would induce conditions favourable to the spread of Irish blight or other disease, should such have found lodgment in the pit. Straw alone is therefore used for covering.

It has been proved by experience in the district that it is better to log-up the sides and one end of the pit, leaving an open end for carting. This reduces the danger from frost.

Messrs. Noonan hold that the most urgent question to be considered by the Millthorpe potato-grower is the question of maintaining the standard of his seed. It is now well known that some of the older varieties are not nearly as successful as they were in years gone by. The practice of saving the second-grade potatoes for next season's seed has gradually weakened the stock. A comparison between the yields of the older varieties and those of some of the newer ones in the Farmers' Experiment Plots will show the great losses which the district has suffered from this cause.

The practice at this farm has been to keep medium-sized potatoes for seed, pick them over carefully after shooting, and sow them whole. But every year considerable quantities of the large market potatoes are cut for seed and mixed with the smaller ones, so as to keep up the stock. In picking over the seed before sowing, all decayed or diseased seed is rejected. The same fate befalls any seed which is untrue to the variety, as sometimes occur. The difference is clear after the potatoes have shot. For instance, in one year a quantity of Manahattans, grown from purchased seed, were found to be badly mixed with Circular Heads. They are both blue potatoes, but the colour of the shoots is very distinct. "Wild" potatoes—degenerated mongrels, with the skin colour through the flesh—are rejected at once.

New varieties are purchased whenever they have indicated their superiority. Above all, the produce of the Farmers' Experiment Plots is carefully harvested and the bags labelled. A small quantity is sold to the Government for seed, but the balance does not leave the farm. Last season only one of the varieties under trial proved inferior, giving an undue proportion of small tubers; but even this variety will be given another trial. The 1910-11 plots provided Messrs. Noonan Bros. with enough seed to sow 15 acres.

The average yield of potatoes in the Millthorpe Farmers' Experiment Plots last year was 5 tons 4 cwt. per acre, the following varieties being conspicuous:—

	tons	cwt.	qrs.
Coronation	7	5	1
Blue Derwent	6	7	2
Brownell's Beauty	6	2	3
Queen of the Valley	6	0	0

The results obtained by Messrs. Noonan over the whole 270 acres compare very favourably with these figures. This should convince any reader that Noonan Bros. take the correct view of Millthorpe's requirements. The basalt soil is not exhausted, and will not show signs of exhaustion for very many years. Increased yields depend mainly upon sowing healthy seed of the most suitable varieties; and indeed, this is the lesson of the Farmers' Experiment Plots in all potato districts where they have been commenced.

Millthorpe men say theirs is the "soundest" farming district in the State; but others will deny the claim. Let every man believe that *his* is the best district, and then strive to make it so. Let him study his soil and his conditions, his crops and his markets. Let him give attention to the science as well as the practice of agriculture. Theory will not make horses go, but it will show the most profitable way to use them. Science and practice together will indicate the best methods; and, "For us, nothing is good enough but the best."

THE BUSH NUT (*Macadamia ternifolia*).

MR. WALTER MARR, Verdant Valley, Nimbin, *viâ* Lismore, has been making some experiments with Bush Nut trees, of which there are thousands in the local scrubs. He has kindly supplied the following notes, which should be of interest to coastal readers:—

> I made a bed of decayed leaves and old staghorns, mixed with an equal quantity of soil, and planted nut seeds in it during July. The plants are all up, and have broken into leaf, but will not be ready for planting out until next June or July. I was advised to crack the shell of the nut before planting, but this is a mistake, as the kernels rot.
>
> If nut trees can be secured in an adjoining scrub, it is much better to transplant the trees from the scrub, as you secure the fruit much sooner. The procedure which I adopted was as follows:—Take a tree about five years old, and cut it back to three short branches before starting to remove it. Do the cutting early in June, and on the first wet day grub around it, keeping at least 18 inches away from the trunk, and getting as much of the tap-root as possible.
>
> Remove the tree to the place where it is desired to plant it, and mix plenty of rotting staghorn amongst the roots. Water well for a week.
>
> I have transplanted bush nut trees in this manner, which, before taking from the scrub, were 12 feet high, and had been bearing fruit for two years.
>
> Our bush nut compares very favourably with any imported nuts, and the trees are very heavy bearers, besides being very ornamental trees. As they are so easy of culture they should be much more frequently seen than they are.

Further information respecting these useful and ornamental trees will be found in the *Gazette*, Vol. IV, p. 3 (January, 1893), and Vol. XVI, p. 1026 (October, 1905).

Passion Fruit Culture on the Kurrajong.

P. G. GILDER, English Master, Hawkesbury Agricultural College.

REFERENCE has already been made in this *Gazette* to the value of the pea on the Kurrajong as an interplanted crop in a young orchard, in providing subsistence for the owner until the trees come into bearing. It was then stated that, with favourable seasonal conditions, the whole cost of orchard upkeep was borne by the pea, especially where labour was plentiful.

A crop which may be taken as standing half-way between an annual, which only occupies the ground for a few months, and the fruit-tree, which may be said to have a life of fifteen years and upwards, is the passion vine (*Passiflora edulis*), which comes into bearing the second year, and continues for six or eight years. The following facts are mainly based (as in the pea article referred to) on the actual experience of Mr. William S. Arnold, of Samarai, Kurrajong, a contemporary diploma student of the writer, who kindly placed the account sales for one year at his disposal, and thus enabled a comparative statement of the value of the summer and winter crops to be compiled.

The area suited to the profitable cultivation of the passion vine in New South Wales is certainly a limited one, but is nevertheless capable of much more effective exploitation than at present. It may be taken as a general rule that easily-worked ground (preferably newly cleared), a frost-free situation, a slope with a good aspect and with a fair amount of shelter, ample drainage and reasonable distance from rail, are essential. The necessity for freedom from frost cannot be too strongly insisted upon.

The land should be of good quality, and if possible should contain a fair percentage of lime. Just at the particular spot where the passion vines are planted on Mr. Arnold's property, there is ample evidence of the existence of a calcareous sandstone (with from 12 to 40 per cent. of lime) below the Wianamatta shale and above the Hawkesbury sandstone. This most probably conduces to the luxuriant growth of the passion vine. It is also of interest to note that on the Kurrajong, where the edible form flourishes, the native passion (*Passiflora aurantia*), which is not edible, is found. The presence of the native variety apparently indicates the suitability of the locality for the cultivated plant.

It is easily grown from seed, and while plants fit to put out are often obtainable at from 6s. to 12s. per 100, unless time and the loss of one growing season are a consideration, there is no reason why the plants should not be raised at home. Possibly the best plan to adopt is to purchase, either from a neighbour or from the markets, a quantity of the very best fruit available, extracting and freeing from juice the seed and sowing in February. The rows should be 30 inches or 3 feet apart, and the seed every inch or so in the row, afterwards thinning out to 3 inches apart to make good stocky plants. A half-case dealt with in this way is sufficient for an acre and a half.

The ground should be well prepared in the autumn, and the passion vines planted out in August or early in September. The rows are placed 10 feet apart, with the vines every 12 feet in the row, thus requiring about 363 plants for the full acre.

Substantial fencing posts, 5 feet out of the ground and 18 inches or 2 feet in it, are placed at every 24 or 36 feet, with a strong stay at each end of the row, as the weight of the plants in a year or two becomes considerable. Some growers prefer a wire at the top, with a second about 3 feet from the ground, but the consensus of opinion favours two wires only at the top, about 6 inches apart and on the same level. This facilitates both horse cultivation and hand chipping, and especially (as will be seen later) pruning.

A stick or lath is needed to support the one shoot of the young vine until it reaches the two wires at the top, when two or three leaders are permitted to grow each way, all other growth being stopped. These leaders must be firmly but not too tightly tied to the wires.

The necessary cultivation incidental to general orchard work must be carried out during the year, and in the second season a fair crop may be expected. The maximum will be reached the third and fourth years, with a gradually lessening but still profitable yield until the sixth year, according to the favourableness of the soil and weather conditions.

While the passion vine is a heavy yielder, and manuring may be necessary during the life of the plant, it is open to question whether it pays to manure heavily at the outset. There are probably ample areas available which are sufficiently fertile without supplementing the resources with artificials.

On the land belonging to Mr. Arnold no manure was used at planting time, but on a piece of 2 acres, when the vines were four years old and woodiness was showing itself in the fruit, a heavy dressing of 12 cwt. per acre of Shirley's No. 5 (costing £9 2s. 6d. per ton) was made just after the November pruning. This happened to be the only manure available at the time, but the vines responded at once, and the fruit of the succeeding crop proved as good as ever. In the opinion of the grower, the manuring was a highly profitable investment. This disease, woodiness, is the only one which has proved detrimental, and the sole cure seems to be the encouragement of a healthy impetus in the growth of the vine by generous manuring, especially when followed by rain.

The one outstanding feature about the vine, however, is its habit of producing two crops per annum; in fact, it may be said to be yielding fruit for nine or ten months of the year. The summer crop comes in about February or March, when the market is glutted with other fruits, and prices are often below actual marketing costs. The winter crop is ready for pulling when few fresh fruits are available, and extremely high prices are given for choice specimens to supply a much needed relish to the apples, bananas, &c., in the fruit salad.

The aim of the grower, then, must be to prune away the summer crop when about half grown (or early in November) in order to stimulate the vines to throw out fresh fruiting laterals for the winter.

The sacrifice of three-fourths of the total growth, with its heavy crop of fruit, may seem a wanton waste, until the returns for the year are analysed. From an area of 2 acres of six-year-old vines, and 3 acres of four-year-olds, a total of 1,322 half-cases was taken from January to October, 1911. A much greater, though far less profitable yield, would have been obtained had no pruning been carried out. From these, after paying all expenses of marketing, such as cost of cases, commission, &c., the net return was £162 1s. 4d., or an average of £32 8s. 3d. per acre, which, after allowing for interest on capital value of the land, planting, cultivation, pulling, packing, and carting to the station, leaves a substantial profit.

In dissecting these figures, it should be noted that it is not claimed that the returns are in any way exceptional. The attempt has merely been made to analyse the circumstances under which the crop is raised, and to point out the advantages and disadvantages of certain courses of action, illustrating by actual figures of the latest possible date. These passion vines were grown in connection with some 30 or 40 acres of orchard and mixed crops, received no special treatment, and the returns are only selected because they represent a very fair index of market values throughout ten months of the year in three different centres.

Experience goes to show that Sydney is speedily glutted with this fruit, and new markets had to be found. Melbourne proved a fairly satisfactory substitute, but a port outside the Commonwealth afforded the most profitable outlet. The following summary may be of interest:--

Cases.	Period.	Market.	Average net price per half case	
			s.	d.
392	Summer	Sydney	1	1
271	Winter	,,	2	3
663 Total.		,,	1	7
198	Mostly winter	Melbourne	2	4
426	,, ,,	Non-Australian	3	8¼
35	,, ,,	Local sales	4	10
1,322 Total.			2	5½

The figures for the summer (or January to March) crop, viz., 1s. 1d. per half-case, appear even better than they actually were, as in some instances the net return was less than 6d. per case, and though the fruit was of a high standard, a few boxes remained unsold and were taken to the "tip." Under such circumstances no further consignments were sent at the time, and considerable waste was inevitable.

Even with the crops pruned as harshly as indicated, a fair proportion (roughly a third of the total) remained to be pulled during the summer, and great care has to be taken to ensure that this can be marketed without financial loss.

An interesting lesson of the year's returns is the absolute necessity for grading. To the uninitiated, it may seem that passion fruits are all as like one another as peas in a pod, but the market clamours for and pays the necessary price for first-class fruit. This is the more emphasised when the market is comparatively bare. A September account sales shows as high as 14s. 3d. for a half-case to as low as 6s. 3d. in the same consignment. It may safely be asserted that more than twice as much is paid for the first quality as for the ungraded stuff, which will only realise the price of the lower grade. The following indicates the sales on one occasion:—Two at 12s.; three at 11s. 10d.; five at 10s.; one at 4s. 9d.; three at 4s. 8d.; and one at 4s. 3d. In this instance there were three distinct grades, and five half-cases in each.

It has not been thought desirable to discuss the question of growing passion vines between young trees. In any case only two rows could thus be planted between each row of trees, and the interference with cross cultivation necessitates a serious increase in labour charges. There is no doubt, however, that after the passion vines have outlived their period of usefulness, the orchard trees can be placed in position with little detriment, though the growth of a leguminous crop would profitably fill the season's gap before this is done.

In conclusion the salient points may be summarised thus:—(1) The passion vine, provided site and soil are suitable, is fairly easily grown, cheaply maintained, practically free from disease, does not encourage the fruit-fly, and may form a valuable "side line" for the struggling orchardist. (2) Unless carefully handled, however, it may easily prove a burden instead of a blessing, as the local market is easily glutted, and exporting to European ports has not yet been placed on a satisfactory basis. (3) The summer crop, no matter how choice, must be ruthlessly sacrificed to ensure a winter yield, which alone is profitable. (4) Grading is absolutely essential to complete success, and often makes all the difference between a satisfactory profit and a distinct loss.

SUCCESSFUL GRAFTING OF APPLE STOCKS.

MR. E. G. WEBB, of Bathurst, last year grafted 4,722 apple stocks. He was advised by the Fruit Expert of the Department not to start until September, but as he had such a large number to do, and no help, he commenced on 1st August; in fact, he had already done 300 during the first week in July. Of these 300, none missed until a hailstorm came, when 6 or 8 missed. Of the total 4,722 grafts, 4,508 are growing; in 64 cases the stock grew; in 63 the stock died; and 87 cases are doubtful, having only a few green leaves on them, whilst the others are branching. The apples were of nine different varieties.

Canker in the Apple.

By H. M. EDDIE, F.R.H.S., Kanaka Valley Fruit Farm, Albion, British Columbia, in "*The Fruit Magazine.*"

UNDER this common term scientists have identified two distinct species of fungi. Their names are *Glœosporium malicorticis* and *Nectria ditissima*, formidable names to the botanically uninitiated, but more formidable still in their actuality to the practical fruit-grower.

Much ignorance regarding these terrible pests is prevalent among fruit-growers; their perfectly evident depredations I have heard referred to as being accountable to frost. Frost may in a way help the spread of the disease by injuring unripened wood, but is not the cause of all the trouble.

I would especially draw the attention of owners of young orchards to the seriousness of canker, which may be caused by either of the above fungi, and the risks they are running in allowing the disease to go unchecked, and to the fact that it is preventable, and can also be cured.

The first-mentioned, also known as *Anthracnose*, usually makes itself apparent early in the fall, when small areas of the bark, about the size of the point of your finger, may be noticed to have stopped growing, and to have a flattened and sunken appearance; they are also darker in colour than the surrounding bark.

These spots slowly increase in size, and acquire an oblong shape when full-grown. If a knife is used to investigate, it will be found in the dissection of the canker spot that under the outer layer of bark the underlying tissues are dead, brownish in colour; and if the disease is far advanced the infected tissues will have parted from the healthy as if by contraction.

Unlike the latter-mentioned fungus, this one does not appear to spread by continuity of tissue, but by spores alone. Early in November* the fungus comes to maturity and commences to disseminate its spores, which may be carried by the wind or other agency to other parts of the tree, to other trees, and even to other orchards.

The cause of this canker does not appear to be perfectly understood yet, but any condition whatever which lowers the vitality of the tree predisposes it to contract the disease. Continual "wet feet" and consequent sourness of soil are active causes, therefore every means which tends to promote health ought to be employed. In young orchards where the disease has not appeared I would strongly advise a thorough spraying with the winter strength of the lime-sulphur solution as a preventive.

* This would correspond to May in this country.—ED.

Where it has made an appearance the affected branches may be cut off and burned, but if the trunk is affected the infected parts may be cut out and burned, and the wound dressed with tar.

In old trees this latter operation, for obvious reasons, cannot be employed, but by thorough and persistent spraying the ravages of the disease may be considerably lessened. This canker fungus, unlike the other, also makes itself manifest on the ripe fruit in the form of small round spots, the tissues assuming a dark brown colour. These spots are always concave in shape, and thus are easily distinguished from rot caused by bruises.

Infected fruit ought to be picked out and destroyed, as infection may quite easily emanate from the fruit-room.

Turning now to the second-mentioned fungus, viz., *Nectria ditissima,* we find that the symptoms are similar to that already discussed, but on closer inspection we find that there are differences. It has not got the distinctive crack surrounding the mature fungus, the *Anthracnose.* We find also that it spreads by means of its mycelium, which may travel for quite a distance under the bark, to reappear again and complete the life-cycle of the fungus on some other part of the tree; but, like its neighbour, it also increases by spores which appear about the same time.

The same remedies and preventive measures as advised above are also efficacious in this case, but the incisions to be effective must be performed on the first appearance of the disease.

Canker, in general, acts in a very erratic manner, which makes it very difficult to ascertain all the causes of the disease, for assuredly there are many. Some varieties of apples are more prone to it than others.

If one variety in an orchard cankers alongside others that do not under the same conditions, it is pretty evident that the variety is unsuitable. If the trees are young I would advise cutting over and regrafting with a variety which does not canker in the same orchard; but if they are old I leave it to the discretion of the owner whether their returns justify their retention or not. Do not omit the spraying, however; but even when all is done they are a continual menace to healthy stock around.

To illustrate the erratic actions of canker, in previous experience I have seen Ribston Pippin canker under apparently the same conditions in which Gravenstein did well, and now I find Ribston Pippin perfectly healthy under apparently the same conditions in which Gravenstein cankers "to beat the band."

This article is directed more especially to those who are planting young orchards and are new to the business. I wish you to realise that canker is one of the worst, and is the most insidious, of evils the fruit-grower has to contend with, and in no other is the old adage, "A stitch in time saves nine," more applicable. Therefore, I exhort you owners of young orchards to employ every means in your power to keep your trees healthy, to spray to prevent it, and spray, and spray, and spray to get rid of it.

IS IT NECESSARY TO FERTILISE AN APPLE ORCHARD?

BULLETIN No. 339, New York Agricultural Experiment Station, gives results of an experiment conducted for fifteen years to determine this point, and the evidence is to the effect that it is not usually necessary to use fertiliser. The soil was a clay loam, too heavy for a good orchard soil, and not better than the average clay soil in the farm lands of Western New York. The orchard was given the same care as in a commercial plantation, cultivation and green manuring being given regularly. There were twelve plots of five trees each, separated by single rows of trees not in the experiment. There were four fertilised plots in duplicate, and four check plots. The variety was Rome, top-worked on Ben Davis. The fertilisers applied were as follow:—

Manure.	Amount per Year per Tree. lb.
Stable manure	415·15
Acid phosphate...	12·6
Muriate of potash Acid phosphate	7·26 12·6
Muriate of potash Acid phosphate Nitrate of soda Dried blood	7·26 12·6 3·67 12·84

As the manure was spread over an area slightly greater than that covered by the branches of the trees, a tremendous excess of each was used.

After fifteen years' observations, the Station authorities conclude that the fertilisers have had no sensible effect upon the yield of fruit. The size of the apples is possibly increased by the fertilisers, and the foliage in the plots receiving nitrogen was greener than in others last season; but all the trees, manured and unmanured, bore crops very uniform in maturity, keeping quality, texture, and flavour of apples.

It is stated that it may be necessary to fertilise apple orchards on sandy and gravelly soils, on lands very subject to drought, on very shallow soils, and on soils quite devoid of humus. Some soils may require one of the chief elements of fertility; some, though few indeed, need the three which usually constitute a complete fertiliser. The concluding advice is:—

> A fruit-grower may assume that his trees do not need fertilisers if they are vigorous and making a fair amount of new wood. If the trees are not vigorous the drainage, tillage, and sanitary condition of the orchard should be looked to first, and the fertilisation afterwards, if then found necessary. Lastly, before using fertilisers, the fruit-grower should obtain positive evidence by experimentation as to whether an orchard needs fertilisers, and what ones.

This experiment was planned by Director W. H. Jordan and Professor S. A. Beach. The work was in the hands of Professor Beach until 1905, since which time it has been in the charge of Professor U. P. Hedrick. We cannot say how far the conclusions are applicable in New South Wales. Experiments are now in progress in Departmental orchards. But it is felt that growers here should know the results obtained in New York.

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Sackville	Mr. C. H. Britten, Sackville.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. T. Collins, jun., Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. S. Mann, Good Hope, Yass.

OBJECTS.

The objects of the Bureau are to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

The Government will subsidise the branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements. Regular monthly meetings should be held, and arrangements made for papers to be read at the meetings by members on various points of local or general interest in connection with agriculture, and these papers should be fully discussed. Whenever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

Common Pests.

The Department is willing to supply to any branch requiring same, a set of insects, being the common pests of the district, if a glass-topped case 10 in. x 14 in., which will cost about 7s., is provided. Arrangements could be made for the case to be obtained in Sydney.

Bonville.

The meeting of the Bonville Branch on the 3rd January took the form of a demonstration by the Honorary Secretary, Mr. H. B. Faviell, in the use of explosives in clearing land of stumps and standing timber. A stump was selected, which it was considered would take one man a full day or more to grub and remove at a cost, including horse and cart, of at least 12s. Mr. Faviell bored holes underneath it and inserted eight charges of rend-rock and half a plug of gelignite to assist firing, as rend-rock is difficult to fire. The holes were then plugged again with damp earth. The charges were fired by means of an electric current, and on examination it was found that a large portion of the stump—root and all—had been blown fully thirty yards away, and the remainder left lying loose in the ground. The operation did not occupy more than half an hour, and there was no hard labour in connection with it. Mr. Faviell reckoned the cost of blowing out the stump at 3s., the work being done in half an hour, as against one man's labour for a whole day. A second stump was also treated, but rack-a rock was used instead of rend-rock. Both these explosives are carried on the railways as ordinary freight. A charge was also put into a standing tree, which was considerably torn, so that a fire would burn readily and destroy it in a day. Of course care should be exercised in the handling of the explosives, and Mr. Faviell would be glad to give further information to any members of the Bureau regarding the system he is using.

The Department is greatly interested in these operations, having already written to America for details of the experiments in this direction which have been carried out in the United States.

Cardiff.

Mr. J. G. R. Bryant, Assistant Fruit Expert, lectured the members of this branch on the 5th January on "Fruit Culture." He dealt with the cultivation of trees, their diseases and remedies, and the packing and disposal of the fruit. Although the night of the lecture was a very wet one there was an attendance of about forty.

Carlingford.

"The Care and Selection of Domestic Animals" was the subject of a lecture delivered on the 20th January by Mr. Veterinary Officer Palgrave.

Gunning.

The Assistant Fruit Expert, Mr. J. G. R. Bryant, delivered a lecture on the 11th January on "Fruit Culture." There was a fair attendance of members and their friends.

The following are new members of the branch :—Messrs. J. Holgate, J. D. Chapple, F. Chapple, C. Lang, and E. I. Reardon.

Inverell.

In the lecture which Mr. Inspector McDonald recently delivered on "Pigs," he pointed out the great necessity for intending pig-raisers to start with absolutely pure-bred stock. The nondescript type would prove to be unprofitable, as they took at least two months longer to reach the desired weight, and were then fully 10s. lower in value than the progeny from pure-bred stock. The weight for factory requirements should range from 100 lb. to 140 lb., the best weight being about 120 lb., and that weight should be attained in from five to six months. The lecturer considered the Berkshire breed the best pure-bred pigs for the producer, as they matured early. The bacon, however, was not as prime as that from a pure Tamworth, as it contained rather too much fat. The cross between the Berkshire and the Tamworth for all purposes could not be equalled. The Berkshire-Tamworth cross were also excellent mothers, being good foragers and splendid for grazing. The Yorkshire breeds, although they gave excellent bacon, were not recommended for a warm climate unless crossed. To produce first-class bacon, the ration should be well balanced. Peas, pollard, skim milk, and wheat will produce good hard flesh, and maize will produce fat. Skim milk and maize were a good ration to top-off with. Lucerne, rape, barley, and cowpeas were good for grazing, but to produce first-quality bacon, it is essential that a solid ration should be fed, consisting of grain and skim milk, for at least four or five weeks before killing.

Katoomba.

Messrs. W. E. Collett, of Hazelbrook, and D. Boyd, of Megalong Valley, have joined the branch.

Kellyville.

On 1st February, at 7 p.m., Mr. Veterinary Officer Palgrave will give a lecture on "The Treatment of Wounds and Colic," to the members and their friends.

Little Plain.

The first annual report of the branch for the year ended 30th September last shows that ten ordinary monthly meetings have been held, with an average attendance of thirteen members. Two lantern lectures and a practical veterinary demonstration have been given by officers of the Department, all well attended and much appreciated. Papers on agricultural topics have been read by Members Leech, Rainger, Maher, Taafe, F. Stening, White, Cosh, Blyth, and Hobbs. The balance-sheet shows an income of £4 12s. 6d., and expenditure of £2 2s. 3d., leaving a credit balance of £2 10s. 3d., with an amount of £2 6s. 3d. due from the Department for subsidy.

On the 16th January Mr. A. J. Pinn, Inspector of Agriculture, delivered a lecture on "Irish Blight in Potatoes."

Messrs. G. B. Lewin, E. J. McBean, T. C. Armstrong, and C. E. Armstrong have joined the branch.

At a recent meeting a discussion took place on "Co-operation," and it was agreed that the time had arrived for the farmers to "pull together" if they wished to reap the full benefits of their labour.

At each meeting the subject for discussion at the next meeting is announced, so that members may become conversant with their subject. The idea is worthy of imitation by other branches.

Lower Lawrence.

Arrangements are being made for a lecture to be delivered by Dairy Instructor Chapman at an early date on "Cattle and Dairying."

Penrose.

In response to a request for lectures by Departmental experts, arrangements can be made for a lecture to be delivered on the 20th February, by Mr. T. G. Palgrave, M.R.C.V.S., on "Equine Diseases," or "Diseases of Sheep." Lectures on other subjects will follow.

St. Mary's.

A lecture was delivered on 27th January by Mr. Bradshaw on "The present condition and future prospects of the Poultry Industry."

Wagga.

At the conclusion of the first year of its operations the Wagga Branch has a membership of thirty-eight. Since the present energetic Honorary Secretary, Mr. G. H. Kelsey, took charge of the Branch, it has shown signs of great improvement, and he anticipates soon a membership of over sixty.

Mr. Veterinary Officer Palgrave will deliver a lantern lecture on "Conformation and Unsoundness in Horses," in the local Town Hall, on the 6th February.

Walli.

At the annual meeting of this branch the following officers were elected :—Chairman, Mr. J. Adams ; Vice-Chairman, Mr. C. J. Allen ; Honorary Secretary and Treasurer, Mr. A. V. Bloomfield, of Walli. The subscription for the year has been fixed at 2s. 6d.

Orchard Notes.

W. J. ALLEN.

FEBRUARY.

Cultivation.

THIS work may still be continued to keep down weeds and retain the land in a state of tilth.

Re-working Old Trees.

The early part of this month is the best time to bud to better varieties all poor or worthless varieties of fruit-trees found growing in the orchard. Be sure that the buds to be used are taken from trees which have borne fruit of the very best quality. Insert them on the outer or underneath side of the limbs, where it will be found that the bark usually raises more easily than on the upper side, and where they are more apt to form a well-shaped tree than where the buds have been inserted on the upper or inner side of such limbs.

Codling Moth.

Wherever spraying has been thoroughly carried out, the Codling Moth has been kept under satisfactorily. In cases where the moth is prevalent, whether on sprayed or unsprayed trees, see that bandages are given careful and regular attention, and that all infested fruit is picked from the trees and ground, and destroyed by boiling or burning in accordance with the regulations under the Fruit Pests Act.

Pick up and destroy all fly-infested fruit.

Green Manuring.

Towards the end of the month arrangements should be made for sowing leguminous crops such as are required for green manuring, and as the fall and winter are the only seasons when such crops can be grown among the trees without robbing them of moisture, it is best to sow only such varieties as will make a fair growth during the cooler and cold months.

Such crops as grey field peas, tares, &c., are depended on to furnish nitrogen and organic matter to keep the soil in a high state of fertility.

Harvesting Fruits.

Harvesting of fruits will still be continued. Fruit for export will be ripe enough for picking and packing towards the end of this month or early in March. Send only the very best fruit. It should be well coloured, of good size, evenly graded, and neatly wrapped and firmly packed. The fruit should be picked and handled carefully in order to avoid bruising, and should be kept as cool as possible from the moment it is taken from the tree until it is stored in the boat for carriage to Europe. Use good, strong, clean cases for holding the fruit, and have them stencilled neatly and legibly—as anything is not good enough, but only the very best.

Can, dry, and convert into jam all surplus fruits. Fruits for drying purposes promise to be late in ripening this year, and unless we get a good spell of dry, hot weather in the autumn, sultana and raisin growers may again find some difficulty in curing their fruit. It would be well, therefore (as an insurance), to make some preparation for evaporating them, should the weather conditions prove unfavourable for sun-drying. Any hot room where the air circulates freely will serve the purpose for finishing off the fruit, provided it can be first fairly well dried in the sun.

Red, Brown, and Indian Wax Scale on Citrus Trees.

Trees may be either fumigated or sprayed for the destruction of scale insects. This work may be carried out this month, provided the trees are in good strong condition, but as this is usually a very hot month the work will have to be done on cool days or at nights, but never fumigate during the heat of the day at this time of the year.

Pamphlets dealing with fumigation and sprays for scale insects on citrus fruit may be secured gratis on application to the Department.

Acknowledgments.

During last month I received a sample case of lemons, grown and cured by Mr. D. Talarico, of Erina, Gosford. The fruit opened up in excellent condition. I have also received some very fine specimens of Japanese plums, comprising Burbank, Climax, and Sultan. The last-named variety was received from Mr. W. Reeve, Taraganda, Bega. This is a newer variety of blood plum, and is, I consider, valuable only on account of its earliness.

KEEPING QUALITIES OF PEARS FOR EXPORT.

On 16th May last, Mr. Frank Coffee handed the Department a pear given him by Mr. Bert. Read, chief steward of s.s. "Makura." It was out of the ordinary ship's stores, and was taken on board before leaving Sydney for Vancouver on 10th March. No particular care was taken to test its shipping qualities; it simply happened to be one left over from the ship's provisions. The pear, when received by Mr. Allen, Fruit Expert of the Department, was in first-class condition. This proves that we have varieties of pears eminently suitable for the export trade.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

Honey Mead.—"H.R.J.": To 3 gallons of water, warmed to blood heat, add 1⅓ pints of honey, ⅔ tablespoonful of ground ginger, ⅓ tablespoonful allspice; mix well together with ¼ pint of yeast. Let the whole stand overnight, and bottle next morning. It is fit to drink in about twenty-four hours.—Albert Gale, *Gazette*, Vol. XII, p. 748.

Pig-proof Fence.—"E.J.T.": There are many kinds of wire fence suitable for pig-fencing. In many districts the ordinary American wove wire fences, such as the "Cyclone," are used, with the wires placed fairly close towards the bottom of the fence. For general purposes, however, we have found that strong wire netting of a small mesh will give as good results as any. I would recommend netting 3 feet high, 1½ in. mesh, and 16 gauge. The advantage of this netting is that the older pigs cannot get their snouts through it, and are thus unable to bite the wires. With the larger mesh netting, trouble often occurs through pigs biting the wires. For safety, it is advisable to place a barb wire top and bottom of the netting, as this prevents the pigs from digging underneath and pushing the netting up, as well as from pushing it down from the top.—Geo. Valder.

Beetles attacking Tomato Plants.—"T.G.F.": The specimen sent is a lamellicorn beetle, the larvæ of which breed in decaying vegetable matter, earth, mould, or rotten wood, and are fleshy white grubs. I have never heard of the adult beetles damaging the roots of plants, though the grubs often eat off the roots underground. All these beetles are readily attracted to a bright light, and if a hurricane lamp were placed in the centre of a shallow dish containing a mixture of water and kerosene, they would fall into the liquid when flying around the light, and be destroyed. I think they would soon be cleared out of the tomatoes.—W. W. Froggatt.

Rhodes Grass.—"T.J.J." (Nana Glen): Yes, there are two grasses, *Chloris Gayana* and *Chloris virgata*, which are both sometimes called Rhodes Grass. As a rule *Chloris Gayana* has given the best results; in fact, it is doubtful if seed of *Chloris virgata* can be obtained at the present time.—Geo. Valder.

Weak Hind Legs in Pigs.—"G.W.": This disease may be due to a worm in the kidneys or tissues surrounding them, or it may be due to malnutrition. A *post mortem* of a pig will decide if worms are the cause. If no worms are present, the food is most probably deficient in lime and phosphoric acid, and as a result certain bone changes occur which result in paralysis of the hind quarters. Where paralysis already exists, no cure can be expected, but it is possible, by adding lime to the food, to prevent the disease. You are recommended to add a dessertspoonful of the following mixture to the food of each pig daily :—Sulphate of iron, 1 part; sulphur, 2 parts; sterilised bone meal, 10 parts. Very young pigs should receive about half these doses. Kindly state whether the cows in your district are in the habit of bone-chewing.—Veterinary Officers of Stock Branch.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (imp).	Wollongbar Farm	*
,, ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
,, ...	Royal Pansy ...	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
,, ...	Jamaica Jack ...	Sir Jack ..	Rum Omelette (imp.).	Wollongbar Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ...	*
,, ..	Grenadin ...	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ..	Vivid (imp.)...	Casino	26 May, '12.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Lismore	31 July, '12.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Palmer's Island ...	15 April, '12.
,, ...	Prince Souvia ...	Vivid's Prince..	Souvenir (imp.)	Casino	11 July, '12.
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	....	†
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Glen Innes Farm...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
,, ...	Prince of Warren Wood (imp.).	Kingsmoor Governor.	Quail... ...	Port Macquarie ...	20 Mar., '12.
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Berry Farm ...	†
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	Singleton	21 April, '12.
,, ...	Calm Prince ...	Rose Prince (imp.).	Gentle (imp.).	Berry Farm ...	*
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Casino	13 June, '12.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 Nov., '12.
,, ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
Ayrshire ...	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
,, ...	Jamie's Ayr ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm.	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
,, ...	Julius Cæsar ...	Auchenbrain Spicy Jock (imp.)	Julia	Grafton Farm ...	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	H.A. College, Richmond	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.)	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

Department of Agriculture,
Sydney, 2nd February, 1912.

BULLS FOR SALE

BERRY STATE STUD FARM.

SHORTHORNS.—Hamlet: sire, Royal Hampton X (imp.); dam, Panacea; calved 30th November, 1910; colour, red. Price, **£15.**

Panacea is by Dora's Boy from Pansy Girl. Pansy Girl is by Favourite (imp.) from Australian Pansy. Australian Pansy is by Airy Knight II from Pansy IV (imp.).

The Pansy strain has proved a good dairying one through several generations of cows.

Henry Irving: sire, Royal Hampton X (imp.); dam, Fauvette; calved 25th December, 1910; colour, red and white. Price, **£30.**

Fauvette is by Favourite (imp.) from Oxford's Fanny. Oxford's Fanny is by Oxford's Forest King from Fanny 78th (imp.)

Fauvette yielded 7,132 lb. of milk last season.

JERSEY.—Sir John Flower: sire, Sir Jack: dam, Calceolaria (imp.); calved 2nd November, 1910; colour, whole. Price, **£30.**

Sir Jack is by Omelette's Pride from Lady Tidy III. Omelette's Pride is by Lucy's Pride from Rum Omelette (imp.). Lucy's Pride is by Melbourne (imp) from Miss Lucy III (imp.).

ARYSHIRE.—Sir Julian: sire, Auchenbrain Spicy Jock (imp.); dam, Lady Julian; calved, 5th December, 1910; colour, brown and white. Price, **£15.**

HAWKESBURY AGRICULTURAL COLLEGE.

GUERNSEY.—Alexander the Great: sire, Claudius; dam, Alexandrina of Richmond; gd., Alexandrina IX (6399, E.G.H.B.); 3d, Alexandrina II (3220, E.G.H.B.); 4d., Alexandrina (3219, E.G.H.B.); calved 6th November, 1910. Price, **£40,** on rail at Richmond.

H. C. L. ANDERSON, Under Secretary.

RAGGED JACK KALE.

MR. EDWIN CHEEL, Botanical Assistant, Botanic Gardens, brought from England in 1905 some seed of a kale known as "Ragged Jack," grown as a vegetable in Kent during the summer months, and considered superior to "Thousand-headed Kale." Mr. Cheel raised the plants in Sydney for several generations, so as to acclimatise the seed, and then supplied samples of seed for trial in the cooler parts of the State—his object being that, even if the plant was not considered to possess much value as a vegetable, it might prove a useful stock feed. Samples were sent to Hawkesbury Agricultural College, and Bathurst and Glen Innes Experiment Farms, on 20th December, 1909, and 7th April, 1910.

At the College the crop grew fairly well until February, 1911, when the plants remained stationary in growth as the result of attacks by aphis, and by the middle of April they were all killed off. Another lot has been planted, and has been transplanted out; it showed very favourable growth in November, 1911, and a further report will soon be available.

At Bathurst Farm the seedlings ran to seed as soon as they were planted out, presumably owing to the lateness of the season. A further sowing and planting out was made in early spring, 1910; but, despite continued spraying, the young plants were eaten out by aphis. They had made satisfactory growth up to the time they were destroyed by the aphis.

The following report, dated 13th November, 1911, has been received from the Experimentalist at Glen Innes Farm:—

> "This fodder plant was sown on 28th July, 1910. The plot consists of 2 rows, 1 chain long and 4 links apart. Germination was very good, but shortly after germination dry weather ensued for about six weeks which checked the growth considerably. Good rains then followed and the plants made a very fair growth.
>
> The plant is dark green in colour, stems and veins of leaves being purple. All the leaves grow from one base, and not along a main stem. The leaves are oval and long in shape, having small leaf-like growths upon the upper surface of the leaf. The root-system is very much like that of the cabbage, consisting of a main tap-root, from which grow fine rootlets. The whole of the plant is succulent, there being an absence of woody fibre. Several similar fodder plants were tried alongside this variety, including White Chou Moellier. Ragged Jack Kale produced a fair amount of fodder, but it is inferior to White Chou Moellier as regards quantity of green fodder.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1912.

Society.	Secretary.	Date.
Berry A. Association	... C. W. Osborne ...	Feb. 7, 8
Moruya A. and P. Society	... P. Flynn	,, 7, 8
Tumut A. and P. Association	... T. E. Wilkinson...	,, 13, 14
Manning River A. and H. Association (Taree)	... S. Whitbread ...	,, 14, 15
Shoalhaven A. and H. Association (Nowra) ...	... H. Rauch... ...	,, 14, 15
Guyra P., A., and H. Association	... P. N. Stevenson ..	,, 20, 21, 22
Gunning P., A., and I. Society...	... J. R. Turner ...	,, 21, 22
Ulladulla A. Association (Milton)	... J. Boag	,, 21, 22
Central Cumberland A. and H. Society (Dural)	... H. A. Best ...	,, 23, 24

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

Society.	Secretary.	Date.
Quirindi District P., A., and H. Association	G. Fowler	Feb. 27, 28, 29
Dapto A. and H. Society	J. H. Lindsay	,, 27, 28
Alstonville A. Society	W. W. Monaghan	,, 28, 29
Inverell P. and A. Association	J. McIlveen	,, 28–Mar. 2
Hawkesbury District A. Association (Windsor)	H. S. Johnson	,, 29 Mar. 1, 2
Bangalow A. and I. Society	W. H. Reading	,, 5, 6, 7
Narrabri P., A., and H. Association	D. J. Bridge	,, 5, 6, 7
Southern New England P. and A. Association (Uralla)	W. C. McCrossin	,, 5, 6, 7
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 5, 6, 7
Bega A., P., and H. Society	W. A. Zingel	,, 6, 7
Braidwood P., A., and H. Association	L. Chapman	,, 6, 7
Coonabarabran P. and A. Association	G. B. McEwen	,, 6, 7
Warialda P. and A. Association	A. J. Devine	,, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 7, 8
Nepean District A., H., and I. Society	P. J. Smith	,, 7, 8
Wauchope P., A., and H. Society	A. D. Suters	,, 7, 8
Oberon A., H., and P. Association	A. E. Burcher	,, 8, 9
Wyong A. Association	J. H. Kay	,, 8, 9
Bombala Exhibition Society	W. G. Tweedie	,, 12, 13
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 12, 13, 14
Campbelltown A. Society	F. Sheather	,, 13, 14
Cobargo A., P., and H. Society	T. Kennelly	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 13, 14, 15
Bowraville A. Association	C. Moseley	,, 14, 15
Port Macquarie & Hastings Dist. A. and H. Society	W. R. Stacy	,, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts	,, 14, 15, 16
Blayney A. and P. Association	H. R. Woolley	,, 19, 20
Gundagai P. and A. Society	A. Elworthy	,, 19, 20
Delegate P. and A. Society	C. J. Lamb	,, 20
Gloucester A., H., and P. Association	S. J. Bignell	,, 20, 21
Merriwa A. and P. Association	A. V. Budden	,, 20, 21
Queanbeyan P., A., H., and I. Association	E. C. Hincksman	,, 20, 21
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Newcastle A., H., and I. Association	C. W. Donnelly	,, 21, 22, 23
Walcha P. and A. Association	J. N. Campbell	,, 26, 27
Luddenham A. Society	F. Shawe	,, 26, 27, 28
Tamworth A. and P. Association	J. R. Wood	,, 26, 27, 28
Molong P. and A. Association	W. J. Windred	,, 27
Cooma P. and A. Association	C. J. Walmsley	,, 27, 28
Yass P. and A. Association	W. Thomson	,, 27, 28
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 27, 28, 29
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 27, 28, 29
Liverpool A., H., and I. Society	W. E. Learoyd	,, 28, 29, 30
Royal Agricultural Society (Sydney)	H. M. Somer	April 2–10
Adaminaby P. and A. Association	W. Delany	,, 10, 11
Bathurst A., H., and P. Association	J. Bain	,, 17, 18, 19
Hunter River A. and H. Association	E. H. Fountain	,, 17–20
Moree P. and A. Society	D. E. Kirkby	,, 23, 24, 25
Richmond River A., H., and P. Society (Casino)	D. S. Gayner	,, 23, 24, 25
Orange A. and P. Association (Jubilee Show)	W. Tanner	,, 24, 25, 26
Dungog A. and H. Association	C. E. Grant	May 1, 2.
Kyogle P., A., and H. Society	M. P. Dunlop	,, 1, 2
Clarence P. and A. Society (Grafton)	G. N. Small	,, 7, 8, 9
Coonamble P. and A. Association	J. M. Rees	,, 8, 9
Deniliquin P. and A. Society	L. Harrison	July 18, 19
National A. and I. Ass. of Queensland (Brisbane)	C. A. Arvier	Aug. 12–17
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 20, 21, 22
Corowa P., A., and H. Society	J. D. Fraser	,, 27, 28
Northern A. Association (Singleton)	F. A. Bennett	,, 28, 29, 30
Albury and Border P., A., and H. Society	W. I. Johnson	Sept. 10, 11, 12
Young P. and A. Association	G. S. Whiteman	,, 10, 11, 12

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Agricultural Gazette of New South Wales.

Sheep and Wool for the Farmers.

THE CROSS-BRED *versus* THE MERINO.

The Standardisation of the Cross-bred.

J. WRENFORD MATHEWS.

FOR some years past the Show of the New South Wales Sheepbreeders' Association has included an exhibit of cross-bred sheep by the Department of Agriculture of this State. Greater interest was, however, lent to this last year's exhibit by the inclusion, in addition to the usual record of live and dressed weights, of particulars as to the value of the various carcases for export and local requirements, as based on an independent valuation by two gentlemen who are probably the largest export buyers in the Australian markets. The sheep and carcases exhibited illustrated a number of crosses from the various breeds on which the official experiments of this State are being conducted. Although final conclusions cannot be drawn at this stage, the facts as now published have a wide and highly important bearing on most of the issues involved. The practical value of the exhibits, and the extent of the information they have afforded to breeders, are indicated by the fact that the Association has, each year since its inception, asked that the exhibit might be continued. Many years have now elapsed since the work of investigating the merits of different breeds of sheep and their suitability under any or all of the varying conditions of this State was undertaken by the Department of Agriculture. The idea of publicly demonstrating the results at the Show originated partly in response to a request by the Committee of the Association, and partly in fulfilment of the Department's own determination to give full publicity to the work.

The Evolution of the Cross-bred.

So far as New South Wales is concerned, the cross-breeding of sheep is a comparatively recent innovation. As compared with other Australian States, Victoria and the Dominion of New Zealand may be regarded as the homes of the cross-bred in Australia. Meanwhile a few breeders in New South Wales, situated in suitable districts, have experimented, in a somewhat casual and haphazard way, it must be confessed, with various permutations and combinations of breeds. The work, however, was destitute of any discoverable system or co-ordination, so that on the Department has devolved the work, so far as the dual-purpose cross-bred is concerned, of practically pioneering this branch of the industry.

Two distinct principles must govern that industry and the use of such types of sheep—two principles so repeatedly referred to in former papers, and so prominent in the minds of all but the least progressive of our breeders—that they scarcely require further emphasis here. It is, however, fitting to point out here that it was not until our oversea markets for lamb and mutton became so firmly established, and assumed such great importance, that the cross-bred became the subject of Departmental inquiry and experiment, and consequently attracted so much more widely the attention of New South Wales sheepbreeders. Breeders have thus placed at their disposal the valuable results of a co-ordinate and thoroughly practical series of experiments, while the Department has gained the full sympathy and confidence of the breeders. This mutual advantage is abundantly proved by the attitude of breeders towards the Departmental exhibits.

The Advance of the Cross-bred.

As this subject undoubtedly calls for full discussion, it is interesting to glance at the steady advance of the cross-bred sheep during recent years, and in the light of the importance now attaching to this exceedingly profitable addition to our sheep and farming industries, to review briefly the present position of Australia, compared with other countries, as a producer of cross-bred wools. According to figures published in *Dalgety's Review* for July, 1911, Australia's share in the output of cross-bred wools is only about one-eighth of the world's total production. Of this small fraction, Victoria and New Zealand supply, as already indicated, the greater proportion. The total export of wool from New Zealand during the year 1910–11 consisted of 493,372 bales, of which 97 per cent. was cross-bred, and the balance 3 per cent. Merino. Victoria's production for the same period included 44 per cent. cross-bred, while New South Wales and Queensland produced 6 per cent. and 1 per cent. respectively.

The accompanying table, taken from the journal named, will show at a glance the comparative output of cross-bred and Merino wools for the various Australian States and the Dominion of New Zealand.

No records, however, are available that show precisely Australasia's position in the production of cross-bred, nor, for that matter, Merino wools as compared with other countries. An approximate estimate may nevertheless be arrived at by taking as a basis of calculation the flocks of the world, exclusive of Australasia, and estimating the number of cross-bred and other breeds separately from the Merino. According to the very latest return published in *Dalgety's Review*, and republished at the end of this article, the total flocks of the world number 582,722,789 sheep, of which 116,034,173 are represented by Australasia. By deducting this latter number from the total production, there is left for calculation purposes 466,688,616, of which it is estimated that 66 per cent. would represent breeds other than pure Merino, leaving the remaining 33 per cent. for pure Merino sheep in other countries. For the purpose of arriving at a fairly reliable estimate, it will be necessary to ascertain the number of bales exported from Australia last

MERINO AND CROSS-BRED SALES.

Dalgety's Review, 1 July, 1911.

Description.	Sydney.		Melbourne.		Geelong.		Adelaide.		Fremantle.		Brisbane.		Tasmania.		New Zealand.		Total. 1910-11.	
	Bales.	%	Bales.	%	Bales	%	Bales.	%	Bales.	%	Bales.	%	Bales.	%	Bales.	%	Bales.	%
Merino	739,601	94	219,740	60	58,794	53	130,321	90	1,145	79	212,398	99	8,599	44	7,512	3	1,378,110	74
Cross-bred and all strong wool breeds	44,708	6	146,494	40	52,139	47	14,728	10	305	21	2,762	1	10,821	56	215,100	97	487,057	26
	784,309	..	366,234	..	110,933	..	145,049		1,450	..	215,160		19,420	..	222,612	..	1,865,167	..

OVERSEA SHIPMENTS.

States.	1910-11.		1909-10.		1908-9.		1907-8.		1906-7.	
	Bales.	Net Weight. lb.	Bales.	Net Weight. lb.	Bales	Net Weight. lb.	Bales.	Net Weight. lb.	Bales.	Net Weight. lb.
New South Wales	923,831	304,864,230	931.208	307,598,640	915,617	296,659,908	777,748	267,545,312	837,869	298,254,150
Victoria	501,835	160,085,365	510,343	165,968,475	454,942	147,401,208	462,815	144,959,313	506,650	161,821,087
Queensland	281,352	92,283,456	238,722	78,092,094	184,207	59,683,068	144,640	48,888,320	117,550	40,319,650
South Australia	174,639	56,932,314	160,573	52,206,225	165,513	53,626,212	163,892	52,445,440	146,431	47,736,506
West Australia	73,395	27,449.730	63,555	23,833,329	56,785	18,398,340	50,745	18,420,435	40,789	14,804,407
Tasmania	20,326	5,223,782	17,304	5,018,160	19,283	6,247,692	21,050	5,999,250	13,841	4,041,572
Commonwealth	1,975,378	646,838,877	1,921,705	632,716,923	1,796,347	582,016,428	1,620,890	538,258,070	1,663,130	561,979,322
New Zealand	493,372	173,173,572	512,938	184,144,742	491,757	174,573,735	436,941	148,559,940	427,058	148,189,126
Australasia	2,468,750	820,012,449	2,434,643	816,861,665	2,288,104	756,590,163	2,057,831	686,818,010	2,090,188	710,168,448

SHEEP RETURNS.

(Corrected to Latest Dates.)

States.	1910.	1909.	1908.	1907.	1906.	1905.	1904.	1903.	1902.
New South Wales	45,825,308	46,194,178	43,329,384	44,555,879	44,132,421	39,506,764	34,526,894	28,656,501	26,649,424
Victoria	12,937,983	12,937.983	12,545,742	14,146,734	12,937,440	11,455,115	10,167,691	10,336,216	10.504,741
Queensland	20,153,239	19,593,791	18,348,851	16,738,050	14,886,438	12,535,231	10,848.470	8,392,044	7,213 985
South Australia	6,432,038	6,898,450	6,829,637	6,624,941	6,661,217	6,202,330	5,874,979	5,350,258	4,922,662
West Australia	5,157,658	4,692,419	4,098,500	3,694,852	3,340,745	3,120,703	2,853,424	2,600,683	2,704,880
Tasmania	1,735,000	1,728,053	1,744,800	1,729,394	1,729,394	1,583,561	1,557,460	1,597,053	1,672,655
Commonwealth	92,241,226	92,044,874	86,896,914	87,489,850	83,687,655	74,403,704	65,823,918	56,932,705	53,668,347
New Zealand	23,792,947	23,480 707	22,449,053	20,983,772	20.108,471	19,130,875	18,280,806	18,954,553	20,342,727
Australasia	116,034,173	115,525,581	109,345,967	108,473,622	108,796,126	93,534,579	84,104,724	75,887,258	74,011,074

year, and from those two factors to deduce the average number of fleeces to the bale. Taking the 2,468,750 bales as representing the total production of wool, and the 116,034,173 sheep from which this wool was obtained, an average of about 47 fleeces to the bale may be struck. This number, however, is probably less than what would be required to fill the same standard weight of bale by other countries. So that in fixing an estimate on this basis of calculation, an average of 60 fleeces to the bale has been set, which, on being divided into the 466,688,616, works out at a total of 7,778,143 bales. Assuming that of this quantity two-thirds would be representative of all inferior and coarser descriptions of wools, and the one-third balance Merino, the relative proportions would be 5,185,428⅔ bales cross-bred and 2,592,714⅓ Merino respectively.

Additional figures furnished by Dalgety relative to Australia's productions, show that out of the 1,865,167 bales offered last year in the Australian markets, only 487,057 represented cross-breds. This shows the proportion of the Australian clip offered on her own market as compared with the quantity exported for sale in London. In estimating this difference, there is to be taken into account the relative proportion of Merino and cross-bred wools as based on the total production. Of the total quantity offered locally, namely, 1,865,167 bales, 74 per cent. represented Merino and 26 per cent. cross-bred. Allowing this to hold good for the exports, the total output, viz., 2,468,750 bales, would represent 1,826,875 and 641,875 Merino and cross-bred respectively.

For comparative purposes, these figures are summarised as estimated here, together with the tables setting out in full particulars as to the proportion of Merino and cross-bred wools produced by each of the Australian States, and also the Dominion of New Zealand, in tabular form :—

	Merino. bales.	Cross-bred. bales.
Australasia	1,826,875	641,875
Other countries...	2,592,714	5,185,428
	4,419,589	5,827,303

The Conditions favourable to the Cross-bred.

These figures are neither without interest nor destitute of practical value. They serve to emphasise the remarkable progress in the development of the dual-purpose sheep, arising partly out of the general application of more intense agricultural methods, and partly from the natural influence of climatic conditions almost entirely favourable to such types of sheep.

For the greater part of her existence, Victoria has maintained a high reputation for her cross-bred equally with her Merino wools. Since their first entry into Australia, *viâ* Port Phillip, the British breeds have played a most important part in the development of the industry in Victoria. Many districts of Victoria are, like parts of New Zealand, eminently suitable for cross-bred sheep. Possessing a climate ranging from temperate to cold, and favoured by a good rainfall, they produce abundant and succulent herbage. Many breeders, more particularly in the colder districts of Victoria, hold the cross-bred, because of its greater profitableness, in higher esteem than the Merino. Furthermore, it is in those districts, particularly the western, that some of the highest priced and most superfine Merino wools, for which the State is so famous, are grown. Tasmania serves as a further instance of a region where cros-bred types have developed alongside similarly superfine Merino strains; nor does this exhaust the list, for the South Australian sheep industry displays similar features. Within the south-eastern areas of that State the British-Merino combination has again held its own in competition with fine-wool Merino sheep.

Where the Merino is Favoured.

In New South Wales these classes are far less numerous than the Merino, nor has the present increase in cross-breds taken place without extensive comment and much adverse criticism, especially from such growers as hold that the pure Merino, and the pure Merino only, is the sheep for New South Wales. It is often argued that a distinct relative increase of coarser-woolled cross-breds, or even of less fine-woolled Merinos, is certain at least to produce deterioration, if not ultimately wreck the great fine-wool Merino industry—hence the disfavour and suspicion with which the cross-bred is often regarded. This, however, is due to an incomplete appreciation of the conditions under which each breed and type can thrive. Indeed, the extent to which the cross-bred can replace or interfere with the Merino is, as every man of wide experience can testify, rigidly fixed by the strictest laws of climate, and especially of rainfall. The "great outside," as was noted in the very first of these articles, must necessarily always be reserved to the Merino. Still it cannot be laid down finally as a rule that all the areas of sufficient and fairly certain rainfall can be advantageously held by the cross-bred, for in many such districts unsuitable for agricultural methods, and where the breeder is working without artificial feeding or fodder crops, the smaller finer-woolled Merino is undoubtedly the best sheep. The pure Merino has thus its distinct places to fill, and from these it is highly improbable that it will ever be displaced. Its suitability under a dry climate, its ability to thrive on sparse pastures, and the hardiness that enables it to exist during long periods of drought, make it essential that the Merino as a pure type should be preserved in the interest of those graziers who undoubtedly hold, with the Merino, the bulk of the sheep country of Australia. Indeed, in view of the high price obtainable for Merino wool during recent years, and the increased attention which the sheep that can produce high-grade wool is receiving, it is extremely probable that still further development of our fine-woolled Merino sheep may take place. No more profitable field can the smaller producer enter than the endeavour to specialise and standardise the variety of Merino that will thrive best in his own district and on his own run.

The Department of Agriculture has fully recognised this, and in pursuance of its policy of determining, and if possible standardising, the breeds suitable to given districts and localities, intends establishing a Merino flock on all demonstration farms in the far western areas, where sheep-breeding and wheat-growing can be carried on conjointly. Out at Nyngan, which may be regarded as a position somewhat in advance of what might be called the present agricultural frontier, a pure Merino flock has already been established. A similar plan will be put into operation in the spring of this year (1912) at Coonamble, and it is proposed to undertake similar work on the area to be reserved for natural pasture at Yanco, in the south-west, at an early date.

The question, however, of type, and the strain of Merino most suitable to given sets of conditions, are not set down for discussion here. These are matters that require to be dealt with in the fullest detail, and so far as it is possible to enter such a wide field, will receive due attention in our next article.

The Cross-bred a Farmer's Sheep.

Moreover, it must assuredly not be forgotten that the cross-bred is distinctly a farmer's sheep. If extensive areas within belts of fair average rainfall are to be developed along the lines of agriculture or mixed farming, it must be by the employment of what are unquestionably agricultural breeds of sheep. The Merino is not an agricultural breed, never was, and probably never shall be so regarded. Careful study of the origin and early history of the Merino race amply proves this. The Merino is noted for characteristics which distinguish it from all other breeds. Prominent among such traits is the tendency to roam—a tendency still quite noticeable in the Merino of to-day, though the Merino is probably a more domesticated animal in Australia to-day than at any other period of its history. Indeed, there could never have been turned to a profitable account, were it not for the roving nature of the Merino, those wild tracts of interior Australia over which, unaccompanied by any other kind of stock and untrammelled by the presence of man, the Merino roams alone.

The British breeds, on the contrary, are more contented and docile, and comparatively speaking more highly domesticated. Thus, if each type of sheep is placed in its proper surroundings, the Merino and the British derivatives should never come into competition. Conditions typically suitable to one group are necessary typically unsuitable to the other.

Supply and Demand.

With the advocate for the pure Merino we are thus far in full sympathy. When, however, he claims that the development of the cross-bred should be deliberately restricted in order to preserve intact for Australia the fine-wool industry, the Merino breeder advocates a policy which would undoubtedly run counter to the development of the sheep industry as a whole. Such questions cannot be determined as matters of sentiment. Our policy must be such as to secure for the wool industry of this State its two essential factors, utility and permanence. It is safe to say that the world at large is at present enjoying great prosperity. The human family, or at all events the white races, are probably on the whole better fed and clothed than ever before in the world's history. Modern methods and inventions have so assisted and stimulated enterprise that greater comforts are being enjoyed. What was almost impossible in manufacture a few years ago is, by greater knowledge and completer equipment, now rendered comparatively easy. In common with other products, a greater demand exists for wool and mutton, and a greater need for the more serviceable classes of sheep to produce these commodities has been created.

Then again, it is argued with apparent reason that the increased production of cross-bred wools has stimulated the demand for the finer quality Merino. Whether this is so or not, only those intimately acquainted with the manufacturing trade are in a position to say. The statement is at least in some measure supported by the fact that, despite the increased production all over the world of coarser wools and the corresponding decrease in fine-wool production, wools from the cross-bred types are now selling at a higher rate, taking the average value for the past six or seven years, than for any corresponding period in the past. The appended table, from *Dalgety's Review*, gives the average prices of Merino and cross-bred wools ruling in the world's markets for some years past.

Values per lb. clean for Colonial and River Plate Wool.

	Port Phillip, Good.	Adelaide, Avg.	Buenos Ayres, Avg.	Cape Short Washing.	Australian Cross-bred.			
					Fine (Super.)	Fairly Fine.	Medium.	Coarse.
December.	d.	d.	d.	d.	d.	d.	d.	d.
1895	20½	17½	14½	13½	17½	15	15	14½
1899	33½	31	26½	24	25	20	16	12½
1900	19½	17	14½	13½	15	12½	11½	9½
1901	21	18½	15½	14	16	11	8	6½
1902	27½	23½	19	17½	19½	15	11½	9
1903	25	22	19½	17½	20	16	14	11
1904	27	24	20½	19	22	19	17½	16
1905	28	25	21½	20½	24	20½	18½	16
1906	28½	25½	22½	21	25½	21	19	17
1907	27	24	21	20	24	18½	15½	13½
1908	26½	23	19½	17½	21½	16½	13½	10½
1909	28½	25½	22½	20½	26	21	17½	13½
1910	27½	25	22	20½	23	19½	16½	13½

As the tables indicate, cross-bred wool is subject to greater fluctuation in value than pure Merino. This variation, however, is most marked in the case of the coarser descriptions of cross-bred wool, for on comparing their values for the period, as stated in the tables, with the medium and finer quality sorts—the more serviceable classes—it will be seen that these latter have maintained a uniform range of value almost equally with pure Merino.

The following figures taken from the annual report of Messrs. Helmuth Schwartze & Co. for the year 1910 are interesting, as showing the estimates of production of Merino and cross-bred wool in 1895, and during the last twelve years, viz. :—

Colonial and River Plate Wool production. Imports for the season in million lb. clean Wool.

	Estimated.			Proportion of Cross-bred.
	Total.	Merino.	Cross-bred.	
				per cent.
1895	580	396	184	31·7
1899	581	315	266	45·8
1900	503	248	255	50·7
1901	593	308	285	48·1
1902	586	304	282	48·1
1903	556	268	288	51·8
1904	506	244	262	51·8
1905	553	281	272	49·2
1906	596	317	279	46·8
1907	646	355	291	45·0
1908	632	337	295	46·7
1909	718	379	339	47·2
1910	694	397	297	42 8

The Breeder's Policy.

These factors exert, and must always exert, a most important bearing on the present and future conditions of our great sheep and wool industry. Such questions are of national importance. Because they vitally affect the conditions under which he works, they command the attention of every practical sheepbreeder in Australia. They involve to a greater or less extent a change of policy. Up to the present the quantity and quality of wool produced have determined the conditions of wool manufacture. The fine Merino wools produced in Australia, for example, have so gained the attention of manufacturers as to create a world-wide demand for pure Merino wool. Probably Australia could always easily create a market for any class of wool she cared to produce in large amount; but due regard for the manufacturers' requirements might make the industry still more profitable. It is therefore a moot point whether the climatic and agricultural conditions or the market demands should determine our sheep-breeding policy. Should we breed the sheep that will thrive best in the localities at our disposal, or should we do the best we can with breeds that will enable us to meet certain present market demands? Probably both factors will continue to influence the policy of the Australian breeder. Backed up by definite personal knowledge of his local conditions, he must carefully study the demands of the market, and endeavour to raise the class of sheep from which he can obtain the best return. But the commercial return is, in the majority of cases, not a mere matter of the worth of the wool clip at per pound, nor even the average profit per head, but the aggregate value of the sheep, wool and carcase, as a whole. Thus, when wool and carcase, valued on the actual monetary return per individual sheep, favour the class of animal that will, coupled with greater weight of carcase, yield a relatively greater weight of fleece—even supposing it worth less per pound on a quality basis—what inducement is there for the breeder to raise a sheep yielding a finer quality of wool and with a smaller body? Such are the practical considerations which must govern the production of the less finer descriptions of wool. Buyers representing certain sections of the manufacturing trade are always eagerly on the watch for the wools of higher spinning quality. But at the present ruling prices the value of the large fleece of the coarser-woolled sheep is in the majority of cases, and especially in the case of the Merino, strikingly greater than that of the finer woolled types.

In the light of such stubborn facts, it is necessary to consider three vital questions. These are enumerated in what seems to be the order in which they naturally arise out of the conditions we have just outlined. They are:—

(1) *The Case for the Cross-bred*—

Is it necessary, for the sake of preserving for Australia her fine-wool industry, to place any restriction on the breeding of cross-breds?

(2) *Fine versus Medium-quality Wools*—

To what extent is our fine-wool Merino industry threatened by a relative increase of coarser-woolled sheep?

(3) *The Future of the Fine-wool Industry*—

Is the future value of the finer Merino wools likely to be enhanced by such increased production of these coarser descriptions of wools?

That these and other closely allied questions relative to Australia's position in the world's sheep and wool markets are engaging the keenest attention of the world's most prominent operators, and of all who take an interest in our economic system, is shown by the following extract from a fine paper read in London last year by Mr. John Cooke before the International Conference of Sheepbreeders, and subsequently published in the Annual Report of the New South Wales Sheepbreeders' Association. Mr. Cooke concisely summarises his conclusions as follow:—

(1) Australia is the only country producing Merino wool on a large scale and still able to extend its Merino flocks; although the tendency indicates a steady increase in Long-wool breeds in coastal districts.

(2) Australia can steadily increase her exports of wool and greatly increase her exports of frozen mutton and lamb.

(3) New Zealand has great expansive powers in the production of fat lambs; but the large proportion of her drop, fattened and exported as such, will necessarily reduce her mutton shipments.

(4) New Zealand will drop steadily but surely out of Merino wool-growing, replaced and moderately extended by Long-wool and cross-bred sorts grown by small farmers and of varied quality.

(5) Argentina is primarily a cattle and agricultural country; but although sheep have actually decreased of recent years, while cattle have increased greatly, the improvement and stocking-up of vast southern areas with sheep, and the facilities for export and marketing of frozen mutton, will at the very least maintain, if not moderately expand, existing numbers.

(6) Argentine wool of the Merino type will be more and more conspicuous by its absence, the British mutton breeds continuing to expand at the expense of the finer-woolled Merino sheep.

(7) The wool users of the world are largely increasing in numbers, and to a considerable extent in their individual wants, and are wearing more woollen clothing in place of cotton or shoddy garments.

(8) The world's production of wool has not increased of late years, the material reduction in the flocks of Europe and Asia, coupled with the absence of expansion, if not actual decrease, in America, not being adequately at present met by the increased production of Australia, New Zealand and South Africa.

(9) At the present moment the supply of wool is distinctly within consumptive requirements, but a continuance of increase of present remunerative prices will adjust the discrepancy by further stimulating production, especially in Australia.

(10) The masses of the people in Great Britain are eating more mutton and lamb, which improved wages enable them to purchase more freely.

(11) Australasia and South America are equal to the task of fully making up the shortage in the British domestic supply of mutton.

The Object of the Exhibition.

Such authoritative utterances show the absolute necessity for the experimental work which the Department of Agriculture has undertaken, and of which the series of Departmental exhibits at successive sheep shows serves to publish results up to date. A brief summary of the points on which information must be obtained may be fittingly inserted at this stage. They comprise breeding and the standardisation of the cross-bred, loss of weight in transit, difference between live and dressed weight, value for export and local requirements respectively, value of the skin and loss of weight in drying, together with the total value for export and local requirements respectively of each sheep representing the various crosses.

The Breeds Employed.

Most of the breeds comprising the Long and Short-wool groups were represented in the various crosses. Both at Bathurst and Wagga six breeds were tested. The two-year-olds from Wagga included Lincolns and Border Leicesters; the sheep a year younger were of the same two breeds, with Leicesters in addition. Except that the Romney Marsh replaced the Border Leicester, the same Long-wool crosses were exhibited from Bathurst.

Short-wools, comprising South Downs, Shropshires, and Dorset Horns, were shown at one and two years, and as first and second crosses.

It should be unnecessary to state that all crosses of sheep exhibited are not recommended to breeders, especially to those who intend raising a farmer's sheep. Each breed has its own characteristics and its own distinctive part to play in the development of each branch of the industry. The aim was to present the necessary data from which the best sheep for the present wool and mutton demands might be identified. The results are therefore compared and analysed, and should give a definite solution of the problem of breed and cross, once the grower has decided on the district in which he will work and the market for which he will cater. For example, no intelligent breeder would, if he aimed at a profitable wool clip, use for a "first cross" the South Down, Shropshire, or Dorset Horn. Nor would he dream of keeping for twelve or eighteen months, and selling for 15s. or 20s., a sheep that would fetch from 10s. to 15s. at five months old.

The Conditions under which the Sheep were Raised.

Local conditions play a primary part in all such operations. It is therefore necessary to indicate the districts in which cross-breeding for wool and mutton can be profitably carried out. In conjunction with wheat-growing—a primary factor in all systems of mixed farming to which sheep-raising is an adjunct—experiments are being conducted at Wagga, Cowra, Bathurst, and Glen Innes Experiment Farms. These localities will serve as indications of the areas within which such methods can be profitably applied, though by no means do they cover all suitable areas of the State. So far, however, as this year's experiments are concerned, only Bathurst and Wagga are represented. Operations at Cowra and Glen Innes will be brought into line, and next year's exhibition will probably include exhibits from these Farms. A few sheep from Glen Innes have usually appeared in past years among the exhibits. This year, however, the sheep were so reduced by worm troubles that they could not be regarded as typical products of the district, and were consequently excluded. The exhibits from Wagga Farm comprised seventy-four sheep in all, and represented twenty-eight distinct crosses, of which about half were two-year-olds, and the balance a year younger. In this way an opportunity was gained of contrasting similar crosses at a different age. Similarly, forty-eight sheep from Bathurst were penned, representing twenty-eight crosses at corresponding ages.

How they were Raised.

The general method of feeding adopted was to use the sheep to feed-off fodder crops, to keep down weeds, and to take advantage of all feed which appeared spontaneously about the Farm. In addition to natural pasture, the sheep were placed on the stubble after harvest. They were also for a part of the time given the run of the area out of cultivation for the year, on which, especially when the autumn rains are favourable, as they were last year, there is a good growth of herbages of various kinds.

For summer and autumn they were allowed the pickings of a lucerne paddock from which one or two cuts had been taken for hay. Rape was also planted; but as far as Wagga was concerned, this did not prove as successful as was hoped. Usually it fails to make growth during the earlier months of the year; and instead of being ready in late autumn and winter when it is most needed, it is late winter, or even spring, before it becomes available.

On many of the wheat and sheep farms in eastern Riverina, it is customary to crop half the land every year. Where the land has been well cultivated the previous year, and is favoured by seasonable or autumnal rains, a quick growth of herbages of various descriptions takes place spontaneously. Indeed, many farmers prefer this system to the method of fodder crops. An incidental advantage is that under these conditions the sheep enjoy a properly mixed and balanced ration. The great drawback is, however, that unless conditions are exceptionally favourable, little feed is available before the spring. Nevertheless, two ewes to the acre, rearing their lambs, have been kept satisfactorily on this variety of pasture.

Wagga.

The sheep exhibited received the greater portion of their feed on natural pasture. This pasture exhibited an abundant growth, favoured by the successive good falls of rain beginning in the early spring of 1910 and continuing for the greater part throughout 1911. Ample evidence of this is afforded by a comparison of the live and dressed weights of the different crosses exhibited with those forwarded from Bathurst on this occasion and Wagga during previous years. The older sheep were, during the autumn, allowed the run of a lucerne paddock for a total of 60 days, thus providing green feed throughout the year. The younger sheep were fed on natural pasture, with the exception of eleven days on rape. Otherwise, the sheep were not artificially fed in any way. The area on which the sheep were depastured was fairly heavily stocked. In addition to a number of pure-bred flocks of British breeds, it carried a good-sized dairy herd as well as the farm horses.

Bathurst.

Unlike the conditions at Wagga, those experienced at Bathurst during the early part of the year were rather unfavourable, and the sheep consequently did not display their customary bloom when seen in Sydney. Arising out of a combination of circumstances attributable mainly to slow growth and partial failure of the fodder crops, coupled with abnormally heavy rains during the first three months of the year, and the consequent boggy condition of the soil, the sheep failed to receive a good start before the cold weather set in. On arrival in Sydney, both the live and dressed weights were considerably lighter in consequence.

The sheep at Bathurst were raised on a system of rotation crops, each planted at a definite period of the year. As already stated, the Bathurst Farm includes no area of natural pasture. Thus the failure of any one of these crops upsets the working of the system and leaves the sheep low in condition until the succeeding crops become available, and so enable them to regain lost ground. Of such fodder crops, rape and barley, sown in the autumn, furnish the main feed supply. During the spring these crops are ploughed in. In the interval the sheep are fed on the stubble of the wheat crop, and in addition lucerne and, when available, maize are supplied. Owing to the proximity of the Farm to the city of Bathurst, it has been found necessary to fold the sheep at night in dog-proof yards, where, during the winter months, they received the wheat husks from a thrashing machine, mixed with molasses.

The Loss of Weight in Transit.

In view of the loss of weight incurred in despatching fat sheep to the central market, the opportunity was seized of making the consignment from each of these places a test of the amount of such losses. In each case the sheep were weighed a few hours before leaving the Farm, and then again twelve hours after their arrival in Sydney. The time occupied in bringing the sheep to Sydney was forty-four and twenty-four hours from Wagga and Bathurst respectively. The loss in weight, taking the average for each consignment, was 9·57 lb. on the Wagga lot, and 7·6 lb. for the Bathurst sheep Table I gives these particulars in full detail.

Though the loss of weight is considerable, representing a general average loss of 8 per cent. of the total average weight of the sheep, it does not necessarily follow that the shrinkage represents solely loss of tissue or fat. The sheep were weighed on being taken off the pasture, and when full. A

Departmental Exhibit of Sheep at N.S.W. Sheepbreeders' Show, 1911.

TABLE I.—Showing, for comparative purposes, the Loss of Weight in Transit.

From Wagga Experiment Farm.

	No.	Weight at Farm.	Weight in Sydney.	
TWO YEARS OLD.		lb.	lb.	oz.
First Cross—				
Lincoln-Merino	3	153	142	5
Border Leicester-Merino	3	155	137	10
South Down-Merino	3	134	120	10
Shropshire-Merino	3	135	119	10
Hampshire-Merino	3	136	129	0
Dorset Horn-Merino	3	151	146	5
Second Cross—				
South Down x Lincoln-Merino	3	161	149	5
South Down x Border Leicester-Merino	3	132	130	5
Shropshire x Lincoln-Merino	3	168	161	0
Shropshire x Border Leicester-Merino	3	155	148	0
Hampshire x Lincoln-Merino	3	170	164	0
Dorset Horn x Lincoln-Merino	3	175	166	0
Dorset Horn x Border Leicester-Merino	3	181	169	10
Border Leicester x Lincoln-Merino	3	163	152	0
ONE YEAR OLD.				
First Cross—				
Lincoln-Merino	3	116	106	5
Leicester-Merino	3	108	98	10
Border Leicester-Merino	3	116	104	0
South Down-Merino	3	99	89	0
Shropshire-Merino	3	104	96	0
Hampshire-Merino	3	110	95	5
Dorset Horn-Merino	3	115	105	10
Second Cross—				
South Down x Lincoln-Merino	3	107	97	10
Shropshire x Lincoln-Merino	3	110	104	5
Shropshire x Border Leicester-Merino	3	114	103	8
Hampshire x Lincoln-Merino	3	127	119	8
Dorset Horn x Lincoln-Merino	3	129	115	5
Dorset Horn x Border Leicester-Merino	3	132	122	0
Border Leicester x Lincoln-Merino	3	124	119	0

From Bathurst Experiment Farm.

	No.	Weight at Farm.	Weight in Sydney.	
TWO YEARS OLD.		lb.	lb.	oz.
First Cross—				
Lincoln-Merino	3	130	123	5
Leicester-Merino	3	130	130	0
Romney Marsh-Merino	3	125	118	5
Shropshire-Merino	3	121	117	5
Suffolk-Merino	2	129	121	0
Dorset Horn-Merino	3	124	115	5
Second Cross—				
Shropshire x Lincoln-Merino	3	133	122	0
Shropshire x Leicester-Merino	3	141	134	0
Suffolk x Lincoln-Merino	2	152	149	0
ONE YEAR OLD.				
First Cross—				
Lincoln-Merino	3	97	93	5
Leicester-Merino	3	106	93	5
Romney Marsh-Merino	3	101	94	5
Second Cross—				
South Down x Lincoln-Merino	2	119	114	0
South Down x Leicester-Merino	2	111	103	0
Shropshire x Lincoln-Merino	3	106	97	0
Shropshire x Leicester-Merino	3	120	112	0
Suffolk x Lincoln-Merino	2	124	113	0
Suffolk x Romney Marsh-Merino	2	112	98	0

former trial conducted at Wagga showed that after keeping sheep in a shed without food for 15 hours, an average loss in weight of about 6 per cent was recorded. The sheep that formed the subject of this test were two-year-old wethers, weighing from 150 to 160 lb.

The Age of the Sheep.

The age at which a sheep can be most profitably marketed is an important factor in determining the value of different breeds or strains. A number of crosses have had to be exhibited at a greater age than that at which they would have shown the greatest margin of profit. But we are testing these breeds for their wool and mutton value. Many of the breeds employed could be used more profitably for the purpose of raising an early lamb. For example, crosses derived from Down breeds, exhibited at one and two years, can be more profitably utilised to raise a five months' lamb. Yet it is necessary for the purpose of comparison that results from all these various breeds at certain different ages should be recorded. Where experimental work is definitely planned and fully recorded, as much may be learned from the failures as from the more successful experiments. In estimating the value of any particular breed or cross, two factors have always to be taken into consideration—the value of the sheep for wool or mutton, or both. Here the sheep have been classified into groups, with strict reference to their wool-producing and earlier maturing qualities.

For comparative purposes, first and second crosses have been shown separately. Group (1) represented both first and second crosses at the age of two years. Group (2) is a record of similar crosses at one year.

Considerable differences in skin and body weight characterise the breeds at different ages, differences, however, not inconsistent with their known characteristics of breed and early maturity. For example, a comparison of the 142 and 108 lb. live weight of the Lincoln-Merino cross at the ages of two and one year respectively shows a much greater proportional increase in the dressed weight than the 153 and 105 lb. recorded for the Dorset Horn-Merino cross at the same ages, these breeds representing extreme late and early maturity. This can be more readily understood when, on a similar comparison, the 18 and 13, 15½ and 12 lb. weight of skin—taken in the green and dried state, and yielded respectively by the Lincoln-Merino cross—is contrasted with the Dorset Horn's 12 and 8, 12 and 7½ lb. respectively at the same ages. These results, whilst showing a substantial increase in the weight of body, indicate, consistent with the early maturing qualities of the Dorset Horn breed, a material falling off in the proportionate weight of skin, comparing one year with another. This marked case clearly indicates the character of the breeds. The wool-value of the Dorset Horn does not increase in proportion to the age after the first year, indicating that the Dorset Horn, as we have repeatedly emphasised, is an early maturer. The principle is borne out by results for practically all the Down family. It shows their suitability for use in the endeavour to meet the steady demand for an early maturing lamb.

Table II gives these results in a tabular form.

TABLE II.—Showing, for comparative purposes, the live and dressed weights of the different carcases and their value for export and local requirements, with comments as to shape, quality, and suitability for export, from the expert valuations.

From Wagga Experiment Farm.

	Live Weight.	Dressed Weight.	Export Value.			Local Value.		Valuators' Comments.
			Per lb.	Per Carcase.		Per lb.	Per Carcase.	
TWO YEARS OLD.								
First Cross.	lb.	lb.	d.	s.	d.	d.	s.	
Lincoln-Merino	142	81½	1⅞	12	8¼	1·77	12	Heavy weight; shape at this age, fair.
Border Leicester-Merino	149	87	1⅞	13	7½	2·20	16	Long in leg, good loin, slightly bare on hind quarter.
South Down-Merino . ..	115	63	1¾	9	2¼	2·66	14	Deficient in shape, poorly fleshed on fore and hind quarter.
Shropshire-Merino	130	77	1⅞	12	0⅜	2·19	14	Fairly well fleshed, but bare on shoulder and hind quarter.
Hampshire-Merino	136	76	1⅞	11	10½	2·21	14	Slack on fore and hind quarters, otherwise fairly shapely.
Dorset Horn-Merino	153	95	1¾	13	10¼	2·02	16	Rather dark in flesh, fair fore, but deficient in development in hind quarter.
Second Cross.								
South Down x Lincoln-Merino ..	148	82	1⅞	12	9¾	2·34	16	Well developed, deeply fleshed on fore and hind quarters; make good lamb.
South Down x Border Leicester-Merino.	142	83	1⅞	12	11⅝	2·31	16	Practically same as above.
Shropshire x Lincoln-Merino .	170	96	1⅞	15	0	2·25	18	Ideal shape, compact, well developed fore and hind quarter, broad loin.
Shropshire x Border Leicester-Merino.	168	101	1¾	14	8¾	2·37	20	Quality excellent, shape ideal, lower price owing to excessive weight.
Hampshire x Lincoln-Merino ..	175	100	1¾	14	7	2·40	20	Well-shaped carcase, beautifully covered; lower value owing to excessive weight.
Dorset Horn x Lincoln-Merino .	178	108	1¾	15	9	2·44	22	Rather coarse, too long hind quarter, exhibiting slackness behind the shoulders.
Dorset Horn x Border Leicester Merino.	186	100	1½	12	6	2·40	20	Unsuitable for export owing to excessive weight and great length of body.
Border Leicester x Lincoln-Merino	164	96	1⅞	15	0	2·50	20	Rather deficient in leg and fore quarter, but good on loin and back.
ONE YEAR OLD.								
First Cross.								
Lincoln-Merino	108	56	2⅛	9	11	2·75	13	Classed as second quality, handy weight, but too long and narrow.
Leicester-Merino	93	50	2⅛	8	10¼	2·76	12/6	Much the same applies here, but slightly more compact than last carcase.
Border Leicester-Merino	110	60	2⅛	10	7½	2·40	12	Slightly better covered, but not first quality, owing to slackness in leg.
South Down-Merino	90	48	1¾	7	0	3·25	13	Third grade, deficient in all round development, not desirable.
Shropshire-Merino	100	52	2⅛	9	2½	2·54	11	Second grade mutton, bare on hind leg and shoulder.
Hampshire-Merino	92	51	2⅛	9	0⅜	2·59	11	Slightly better on hind quarter, but deficient in shape in fore quarter, second grade.
Dorset Horn-Merino . ..	105	58	2⅛	10	3¼	2·48	12	Better on hind quarters, useful fore quarter, but slack behind the shoulders.
Second Cross.								
South Down x Lincoln-Merino ..	102	52	2⅛	9	2½	2·77	12	Ideal shape, compact, well developed quarters.
Shropshire x Lincoln-Merino ..	102	52	2⅛	9	2½	2·54	11	Good even development, full shoulders, broad loin, equal conformation.
Shropshire x Border Leicester-Merino.	107	59	2³⁄₁₆	10	9½	2·33	11	Most desirable, uniform development, and compact, full shoulder; broad loin and well filled legs.
Hampshire x Lincoln-Merino ..	122	63	2¼	11	9¾	2·47	13	First grade, ideal shape for export.
Dorset Horn x Lincoln-Merino ..	118	63	2⅛	11	1⅞	2·28	12	Rather long and slightly coarse legs, fore quarter well developed, but slackness noticeable behind shoulders.
Dorset Horn x Border Leicester-Merino.	128	77	2⅛	13	7⅝	2·33	15	Fore and hind quarters well developed but inclined, long, slack behind shoulders.
Border Leicester x Lincoln-Merino	128	68	2⅛	12	0½	2·30	13	Rather long, good shape, except for slackness on hind and fore quarters.

TABLE II—*continued.*

From Bathurst Experiment Farm.

	Live Weight.	Dressed Weight.	Export Value.		Local Value.		Valuators' Comments.
			Per lb	Per Carcase.	Per lb.	Per Carcase.	
TWO YEARS OLD.							
First Cross.	lb.	lb.	d.	s. d.	d.	s.	
Lincoln-Merino	126	62	1⅞	9 8	2·51	13	Third grade, inclined, long, narrow, poor leg.
Leicester-Merino	131	70	2	11 8	2·74	16	Second grade, better shape, fair shoulder and leg.
Romney Marsh Merino	121	61	1⅞	9 6	2·74	14	Prominence of bone, bare of leg and deficient in fore quarter.
Shropshire-Merino	140	67	2¼	12 6¾	2·50	14	Fairly evenly developed; good body, but rather slack on the quarters.
Suffolk-Merino	126	71	2	11 10	2 53	15	Too long, unevenly developed, deficient in fore and hind quarters.
Dorset Horn-Merino	116	65	2	10 10	2·58	14	Rather dark in flesh, fair quality, hind quarters not sufficiently well filled.
Second Cross.							
Shropshire x Lincoln-Merino .	127	65	2$\frac{1}{16}$	11 2	2·95	16	Shape ideal, compact full quarters, broad loin and evenly developed.
Shropshire x Leicester-Merinc ..	137	65	2	10 10	2·58	14	Hardly up to the standard of the one previously mentioned, nevertheless displayed good shape and development.
Suffolk x Lincoln-Merino.. ..	157	88	1⅞	13 9	2 31	17	Rather heavy but well proportioned; lower price owing to excessive weight.
ONE YEAR OLD.							
First Cross.							
Lincoln-Merino	91	39	unsuitable		2·10	7	Rejected as being unsuitable for export; condition, poor.
Leicester-Merino	94	43	1⅝	5 9⅞	2·65	9/6	Third grade, wanting in condition and development.
Romney Marsh-Merino	101	46	2	7 8	3	11/6	Long and inclined, narrow, prominence of bone, and spare on fore and hind quarters.
Second Cross.							
South Down x Lincoln-Merino .	111	53	2¼	9 11¼	2·83	12/6	Good shape, compact, very useful class for export.
South Down x Leicester-Merino .	102	50	2⅛	8 10¼	2·88	12	Similar to the above, but hardly as thick.
Shropshire x Lincoln-Merino ..	111	52	2	8 8	2·76	12	Rather low in condition; otherwise, shape and quality first-class.
Shropshire x Leicester-Merino ..	119	51	1½	6 4½	2·82	12	Much the same applies to this carcase, which also was deficient in fat.
Suffolk x Lincoln-Merino.. ..	110	61	2¼	11 5¼	3·93	20	Very deep, splendidly proportioned; at this age supplies a good handy weight.
Suffolk x Romney Marsh-Merino.	96	47	2	7 10	3 06	12	Rather low in condition; consequently deficient in development.

Standardising the Cross-bred.

In this and other papers, frequent reference has been made to certain sheep as "cross-bred." The term is a very general one, and one that is very widely applied. If correct conclusions can be drawn from the experimental work which has been described, it is more than probable that in a few years the word "cross-bred" will have a definite and limited meaning, that is, it will signify the progeny of a Long-wool sire on a Merino ewe. This is the "first cross." The progeny of a Down sire on the "first cross," as here defined, will constitute a "second cross." Since this discussion will involve frequent mention, we propose for the purpose of all future instructional work to make use of a few simple symbols. The letter "M" will always stand for Merino. "L" indicates a Long-wool, and with due regard to the way in which the Long-wools have been classified in order of decreasing fleece production and increasing early maturity, in accordance with the system of classification set forth in the August, 1910, issue of this *Gazette*. Thus, "L_1" stands for the Lincoln; "L_2" for the Leicester; "L_3" for the Border Leicester; and "L_4" for the Romney Marsh. For example, "L_2M" signifies that the sheep is the progeny of a Leicester ram on a Merino ewe. Similarly, the letter "D" serves as an appropriate symbol for the great Down or Short-wool group. A similar arrangement of the members of this family has been made in the contrary order of increasing early maturity and increasing body weight. Thus, "D_1" stands for the South Down, it being at the head of that group; "D_2" is the Shropshire; "D_3" is the Hampshire; and "D_4" the Suffolk. The Dorset Horn occupies a somewhat anomalous position; but since its characteristics relate it more to the Downs than to the Long-wools, it may conveniently be designated by the symbol "D_5." The use of a dash (-) to separate the sire from the dam completes this simple but convenient arrangement of symbols. Thus, to indicate that a sheep is the progeny of a Shropshire ram on a Lincoln-Merino "first cross" ewe, it is only necessary to write "D_2-L_1M." As a further example, and a most important one, it might be stated that when the cross-bred or "second cross" shall have been limited to the sheep to which it rightly belongs, it will have become equivalent to "D_1-L_1M." A glance at the main Table (IV) will afford further illustrations of the system.

The Value of the Carcases.

In determining the value of the carcases, two distinct market demands must be continually kept in view—the local consumption and the frozen mutton trade in foreign, or at all events, oversea markets. The former is limited, and practically invariable; the latter is unlimited, and although exhibiting considerable fluctuation, steadily expanding from year to year. In order to obtain independent and reliable information, the carcases were valued on both an export and a local consumption basis. The valuation for export was carried out independently by two gentlemen who are probably the largest export buyers in Australia. With the object of obtaining their local market values, the most prominent members of the butchering trade were notified of the intention, and the carcases were submitted to the severe test of disposal singly by public auction at the Showground.

Table II is a record of the prices obtained, and needs no comment beyond the statement that prices paid by the local butchers for these carcases are consistently in advance of export rates—and this, as any experienced buyer knows, is not always the case.

Messrs. McCulloch and Walker, the gentlemen who valued for export, fixed their valuation on a basis of 2¼d. per lb. limit for prime mutton, weighing in the carcase from 40 to 60 lb. Heavier carcases were valued at a relatively lower rate. These were the rates then ruling in Sydney for mutton suitable for export. It should be clearly understood that these prices are for mutton, not lamb. For export purposes, there is a considerable difference. Preference was given to carcases scaling from 50 to 60 lb., but a slightly higher rate was allowed for individual carcases exhibiting good shape. In addition to shape, quality and condition carried great weight with the judges, and a short, compact, "well furnished" carcase was always preferred to one that was long and narrow. In this latter respect the Lincoln-Merino (L_1M) cross, especially the one-year-olds, fared badly. The short, compact frame, and well-filled body of the South Down, on the contrary, showed to great advantage when mated with cross-bred (LM) ewes. The identity of the actual carcase is expressed by the formula D_1–L_1M. On a mutton basis of valuation, weight was regarded as a matter of very great importance, and as estimated on a valuation of so much per pound, many well-developed, evenly-shaped carcases, owing to their excessive weights, were dealt with on a lower basis of valuation. Apparently, our European customers do not desire heavy weight mutton ; or if they do, they want to purchase it at a very reasonable rate. This apparent objection can, with a little regulation, be easily obviated. Due attention was given to the points of breeding, and especially determination of the age at which the sheep should be marketed. Note, for example, the difference in valuation between the one and two-year-old sheep as expressed in the formula L_1M. At the age of one year, a valuation of 2⅛d. was fixed. At two years, though superior both in respect to development and condition, the carcase was only valued at 1⅞d. per lb. So it was in the case of many of the second crosses. Here, for another example, is the D_1–L_1M combination of the ages of one and two years respectively. At one year, with a carcase weight of 52 lb., the value was estimated at 2⅛d. per lb. The same cross a year older, weighing 82 lb., did not fetch more than 1⅞d. per lb. By a similar comparison, the value of the "second cross" D_1–L_1M, is further emphasised, in which case ⅛d. per lb. advance is shown in the price of the mutton as compared with D_1M, both crosses being at the 12 months stage.

In estimating the values, the valuators entered upon their duties without any preconceived ideas. The value of each carcase was fixed according to its standard of merit for quality, weight, shape, and condition.

The experts carefully examined individually each carcase as it appeared before them, and were in no wise influenced by any contingencies such as how or under what conditions the sheep were bred, &c., prefering to allow each cross to take its chance as judged upon a commercial basis. For local requirements, although the lighter weights sold relatively at a slightly higher rate, there was little difference in the prices realised between the different crosses at the respective ages of one and two years.

The Value of the Skin.

The value of the skin is a highly important factor in the determination of the aggregate value of the various crosses. The skins were carefully weighed, and the green and dried weights recorded. They were next classed into their respective order for length and quality, and placed under the hammer in the open market. The sheep from Wagga were blade-shorn, whilst the older sheep from Bathurst were shorn by machines. They carried only the nine months fleece. The one-year-old sheep from Wagga were shorn as lambs. Those from Bathurst were unshorn, and consequently carried the full hogget's fleece. The sheep with the heaviest body weight was chosen for killing from each pen. The manner in which heredity operates in the modification of the progeny is strikingly exemplified by the characteristics of the various crosses when studied in the light of their ancestry. These considerations are most marked in the case of the skin, and full details are supplied in Table III, appended.

Consistent with their known relative suitability for wool production, the Lincoln, South Down, and Dorest Horn yielded the extremes of profitable and unprofitable skins in their respective crosses. In the two latter instances this was most conspicuous in both the "first" and "second crosses," *i.e.*, D_1–M and D_5–M; and D_1–L_1M and D_5–L_1M; and at the different ages. Among the second crosses very little difference in value distinguishes one breed from another, except for the fact that the Border Leicester-Lincoln-Merino (L_3–L_1M), owing to its greater weight of fleece, appears to an advantage. Final conclusions cannot, however, be drawn from results in which are compared only one individual of each type. The significant feature is that the results are perfectly consistent with the records published in previous papers.

It is interesting to observe how the Border Leicester has throughout, in "first" and "second crosses," demonstrated its splendid utility as a dual-purpose sheep. Though the Lincoln produced the most valuable skin, owing to its lighter weight of carcase it failed to "make good" as an export type in competition with other crosses.

With the necessary reservation in view of the small number of cases from which these conclusions are drawn, it may be claimed that the tables submitted deserve the most careful scrutiny and confidence as an exposition of the laws of breeding and early maturity.

TABLE III.—Showing, for comparative purposes, the value, weight, length, and quality of the Skins yielded by the various crosses; also the shrinkage in reducing them from their green to their dry state.

From Wagga Experiment Farm.

	Weight.		Value.		Quality specified in "counts."	Length.
	Green.	Dry.	Per lb.	Per Skin.		
TWO YEARS OLD.						
First Cross—	lb.	lb.	d.	s. d.		inches.
Lincoln-Merino	18	13	7	7 7	46s	4½
Border Leicester-Merino	14	10	7	6 10	50s–56s	3¾
South Down-Merino	15	10	6¾	5 7½	58s	2
Shropshire-Merino	14	10	6½	5 5½	58s	1½
Hampshire-Merino	15	10½	6¾	5 10⅞	56s	2
Dorset Horn-Merino	12	8	6¾	4 6	46s	3½
Second Cross—						
South Down x Lincoln-Merino	13	8½	7	4 11½	50s–56s	2¼
South Down x Border Leicester-Merino	16	11½	7	6 8½	50s	2¾
Shropshire x Lincoln-Merino	16	12	6½	6 6	56s	2
Shropshire x Border Leicester-Merino	16	11	7	6 5	56s	3
Hampshire x Lincoln-Merino	18½	13½	6½	7 3¾	46s	3
Dorset Horn x Lincoln-Merino	13	9	7	5 3	46s	2¾
Dorset Horn x Border Leicester-Merino	17½	11	6¾	6 2¼	50s	2
Border Leicester x Lincoln-Merino	18	12½	6½	6 9¼	44s	4
ONE YEAR OLD.						
First Cross—						
Lincoln-Merino	15½	12	7	7 0	46s	5
Leicester-Merino	14	10	6½	5 5	46s	4½
Border Leicester-Merino	19	11½	6½	6 2¾	46s–50s	4½
South Down-Merino	12	9	6¾	5 0¾	56s	3
Shropshire-Merino	13½	9	6¾	5 0¾	50s–56s	2
Hampshire-Merino	12	9	6¾	5 0¾	56s	2½
Dorset Horn-Merino	12	7½	6¾	4 2⅝	56s	2¾
Second Cross—						
South Down x Lincoln-Merino	14	10	7	5 10	46s	3½
Shropshire x Lincoln-Merino	13½	10	7	5 10	50s	3½
Shropshire x Border Leicester-Merino	15¼	11½	6½	6 2¾	46s	4
Hampshire x Lincoln-Merino	15	11	7	6 5	46s–50s	2¾
Dorset Horn x Lincoln-Merino	15½	11	7	6 5	46s	3½
Dorset Horn x Border Leicester-Merino	16	10½	7	6 1½	46s	4
Border Leicester x Lincoln-Merino	18½	14½	6½	7 10¼	44s	5½
From Bathurst Experiment Farm.						
TWO YEARS OLD.						
First Cross—						
Lincoln-Merino	17½	11½	7	6 8½	46s	3½
Leicester-Merino	15	10½	7	6 1½	50s	3¼
Romney Marsh-Merino	13½	10	7	5 10	50s	3
Shropshire-Merino	13	9	6¾	5 0¾	50s	2¼
Suffolk-Merino	14	10	6¾	5 7½	56s–50s	2
Dorset Horn-Merino	12	7½	6¾	4 2⅝	50s–56s	3
Second Cross—						
Shropshire x Lincoln-Merino	14½	9½	6½	5 1¾	46s	3
Shropshire x Leicester-Merino	17	11	6¾	6 2¼	50s	2¼
Suffolk x Lincoln-Merino	16½	12	6½	6 6	46s	3¾
ONE YEAR OLD.						
First Cross—						
Lincoln-Merino	18	14	7	8 2	46s	6
Leicester-Merino	19	14	7	8 2	50s	6
Romney Marsh-Merino	18	13½	7	7 10½	50s	4
Second Cross—						
South Down x Lincoln-Merino	15	11	7	6 5	50s	
South Down x Leicester-Merino	14	10½	7	6 1½	56s	
Shropshire x Lincoln-Merino	18	14	7	8 2	46s–50s	4½
Shropshire x Leicester-Merino	20	14½	7	8 2	50s	3½
Suffolk x Lincoln-Merino	15	11	7	6 5	50s	4
Suffolk x Romney Marsh-Merino	16	11½	7	6 8½	50s	3½

The "Second Cross."

Both for local and export purposes, the most profitable sheep were the "second crosses." At one and two years, the Dorset Horn stands out prominently as a heavyweight, with Hampshire a good second. Despite the fact that the lowest price per lb. was placed on them, these crosses more than made up for the deficiency by the greater weight of carcase. Objections were, however, raised to the dark hue of the flesh of the Dorset Horn cross, and the slight slackness over the shoulder and behind the wither. These characteristics were most conspicuous in the progeny of the Dorset Horn-Border Leicester-Merino ewes (D_5-L_3M), where the weights were exceptionally heavy.

The "First Cross."

Those least favoured were the long, slim carcases of the Long-wool on the Merino. The Lincoln fared worst, and, in one instance, the experts refused to value it at all for export. The Leicester and Border Leicester "first crosses" were slightly superior, but none excited favourable comment at one year. The South Down-Merino cross (D_1M) was considered at either age quite unsuitable for export. With the objections noted, the Dorset Horn took first place among the first crosses.

This disability in the case of the "first crosses" was not so apparent when the two-year-old exhibits were examined, since practically the same prices per pound were fixed on them. The greater carcase weight made them appear at greater advantage.

The carcases which excited most admiration were the South Down and Shropshire "second crosses" at one year old (D_1–L_1M, D_2–L_1M, and D_2–L_3M.) The Hampshire at this age also furnished a nice carcase, but of slightly coarser quality. Little difference in price was assigned these three breeds, so that on a weight basis the Shropshire cross shows the greater margin of profit. Though too heavy for lamb carcases, they would, as mutton, meet the firm demand of a nice handy mutton carcase on the London market.

The Long-wool on the Merino.

A brief glance at results goes to show the value of the "Long-wool cross" (L–M) in the production of a profitable class of skin. To obtain the full value of this cross, as a farmer's or dual-purpose sheep, it is necessary to employ the Down breed (D–LM) to secure a compact carcaseun exceptionable on the scores of weight, shape, quality, and compactness. There is little to choose between the South Down and Shropshire, but for weight and early maturity the Dorset Horn has again asserted its superiority.

Thanks are due to Messrs. McCulloch and Walker for advice and assistance in the valuation of the carcases, and also to the committee of the New South Wales Sheepbreeders' Association for the preparation of and the fine position assigned to the exhibit.

TABLE IV.—Setting out, in the aggregate, the total value of the various crosses for both export and local requirements, together with the symbols signifying the different combinations of breeds.

From Wagga Experiment Farm.

	Symbols.	Mutton Value.		Fat.		Skin.	Total Value	
		Export.	Local.	Weight.	Value at 2⅛d. per lb.	Value.	Export.	Local.
TWO YEARS OLD		s. d.	s. d.	lb	s. d.	s. d.	£ s. d.	£ s. d
First Cross—								
Lincoln-Merino	L_1M	12 8½	12 0	10½	1 10¼	7 7	1 2 1¾	1 1 5¼
Border Leicester-Merino	L_3M	13 7¼	16 0	14	2 5¾	6 10	1 2 11	1 5 3¾
South Down-Merino	D_1M	9 2¼	14 0	8	1 5	5 7⅛	0 16 2⅜	1 1 0⅛
Shropshire-Merino	D_2M	12 0¼	14 0	9	1 7⅛	5 5¼	0 19 0⅝	1 1 0⅜
Hampshire-Merino	D_3M	11 10½	14 0	9	1 7⅛	5 10⅝	0 19 4¼	1 1 5¾
Dorset Horn-Merino	D_5M	13 10¼	16 0	12	2 1½	4 6	1 0 5¾	1 2 7½
Second Cross—								
South Down x Lincoln-Merino	D_1-L_1M	12 9¾	16 0	9	1 7⅛	4 11½	0 19 4⅜	1 2 6⅝
South Down x Border Leicester-Merino	D_1-L_3M	12 11⅛	16 0	9	1 7⅛	6 8¼	1 1 3½	1 4 3⅜
Shropshire x Lincoln-Merino	D_2-L_1M	15 0	18 0	11	1 11⅜	6 6	1 3 5⅜	1 6 5⅜
Shropshire x Border Leicester-Merino	D_2-L_3M	14 8¾	20 0	9	1 7⅛	6 5	1 2 8⅞	1 8 0⅛
Hampshire x Lincoln-Merino	D_3-L_1M	14 7	20 0	14	2 5¾	7 3⅞	1 4 4⅝	1 9 9⅝
Dorset Horn x Lincoln-Merino	D_5-L_1M	15 9	22 0	15	2 6⅞	5 3	1 3 6⅞	1 9 9⅞
Dorset Horn x Border Leicester-Merino	D_5-L_3M	12 6	20 0	14	2 5¾	6 2¼	1 1 2	1 8 8
Border Leicester x Lincoln-Merino	L_3-L_1M	15 0	20 0	9	1 7⅛	6 9¼	1 3 4⅜	1 8 4⅜
ONE YEAR OLD.								
First Cross—								
Lincoln-Merino	L_1M	9 11	13 0	5	0 10⅝	7 0	0 17 9⅝	1 0 10⅝
Leicester-Merino	L_2M	8 10¼	11 6	5	0 10⅝	5 5	0 15 1⅞	0 17 9⅝
Border Leicester-Merino	L_3M	10 7½	12 0	7	1 2⅞	6 2¾	0 18 1⅛	0 19 5⅝
South Down-Merino	D_1M	7 0	13 0	7	1 2⅞	5 0½	0 13 3⅜	0 19 3⅜
Shropshire-Merino	D_2M	9 2½	11 0	7	1 2⅞	5 0⅞	0 15 6¼	0 17 3¾
Hampshire-Merino	D_3M	9 0⅜	11 0	7	1 2⅞	5 0¾	0 15 4	0 17 3⅝
Dorset Horn-Merino	D_5M	10 3¼	12 0	5	0 10⅝	4 1⅝	0 15 4¾	0 17 1
Second Cross—								
South Down x Lincoln-Merino	D_1-L_1M	9 2½	12 0	6	1 0¾	5 10	0 16 1¼	0 18 10¾
Shropshire x Lincoln-Merino	D_2-L_1M	9 2¼	11 0	9	1 7⅛	5 10	0 16 7⅜	0 18 5⅛
Shropshire x Border Leicester-Merino	D_2-L_3M	10 9¼	11 0	6	1 0¾	6 2¾	0 18 0¾	0 18 3½
Hampshire x Lincoln-Merino	D_3-L_1M	11 9¾	13 0	7	1 2⅞	6 5	0 19 5⅝	1 0 7⅞
Dorset Horn x Lincoln-Merino	D_5-L_1M	11 1⅞	12 0	6	1 0¾	6 5	0 18 7⅝	0 19 5¾
Dorset Horn x Border Leicester-Merino	D_5-L_3M	13 7⅝	15 0	6	1 0¾	6 1½	1 0 9⅞	1 2 2¼
Border Leicester x Lincoln-Merino	L_3-L_1M	12 0½	13 0	6	1 0¾	7 10¼	1 0 11½	1 1 11

From Bathurst Experiment Farm.

	Symbols.	Mutton Value.		Fat.		Skin.	Total Value	
		Export.	Local.	Weight.	Value at 2⅛d. per lb.	Value.	Export.	Local.
TWO YEARS OLD.								
First Cross—								
Lincoln-Merino	L_1M	9 8	13 0	6	1 0¾	6 8½	0 17 5¼	1 0 9¼
Leicester-Merino	L_2M	11 8	16 0	7	1 2⅞	6 1⅝	0 19 6⅝	1 3 4⅝
Romney Marsh-Merino	L_4M	9 6	14 0	7	1 2⅞	5 10	0 16 6⅞	1 1 0⅞
Shropshire-Merino	D_2M	12 6¾	14 0	9	1 7⅛	5 0¾	0 19 2⅝	1 0 7⅞
Suffolk-Merino	D_4M	11 10	15 0	9	1 7⅛	5 7½	0 19 0⅝	1 2 2⅝
Dorset Horn-Merino	D_5M	10 10	14 0	8	1 5	4 2⅝	0 16 5⅝	0 19 7⅝
Second Cross—								
Shropshire x Lincoln-Merino	D_2-L_1M	11 2	16 0	7	1 2⅞	5 1⅝	0 17 6½	1 2 4½
Shropshire x Leicester-Merino	D_2-L_2M	10 10	14 0	7½	1 4	6 2¼	0 18 4¼	1 1 6¼
Suffolk x Lincoln-Merino	D_4-L_1M	13 9	17 0	7½	1 4	6 6	1 1 7	1 4 10
ONE YEAR OLD.								
First Cross—								
Lincoln-Merino	L_1M	...	7 0	3	0 6⅜	8 2	......	0 15 8⅜
Leicester-Merino	L_2M	5 9⅞	9 6	5	0 10⅝	8 2	0 14 10½	0 18 6⅝
Romney Marsh-Merino	L_4M	7 8	11 6	4	0 8½	7 10½	0 16 3	1 0 1
Second Cross—								
South Down x Lincoln-Merino	D_1-L_1M	9 11¼	12 6	5½	0 11$\frac{11}{16}$	6 5	0 17 8$\frac{3}{16}$	0 19 10⅝
South Down x Leicester-Merino	D_1-L_2M	8 10¼	12 0	5½	0 11$\frac{11}{16}$	6 1½	0 15 11$\frac{7}{16}$	0 19 1
Shropshire x Lincoln-Merino	D_2-L_1M	8 8	12 0	4½	0 9$\frac{9}{16}$	8 2	0 17 7$\frac{9}{16}$	1 0 11½
Shropshire x Leicester-Merino	D_2-L_2M	6 4½	12 0	5½	0 11$\frac{11}{16}$	8 2	0 15 6$\frac{3}{16}$	1 1 1$\frac{11}{16}$
Suffolk x Lincoln-Merino	D_4-L_1M	11 5½	20 0	3½	0 7$\frac{7}{16}$	6 5	0 18 5$\frac{15}{16}$	1 7 0$\frac{7}{16}$
Suffolk x Romney Marsh Merino	D_4-L_4M	7 10	12 0	4	0 8½	6 8½	0 15 3	0 19 5

Appendix.

WORLD'S SHEEP FIGURES.

Dalgety's Review, 1st July, 1911.

RECENT figures show that the sheep flocks of the world have not increased of late years, whereas the wool-using population continues to expand—a strong argument in favour of continued payable prices for wool. The particulars of latest sheep and population figures contrasted with those for 1895, are as follow:—

Sheep Figures.

	At Latest Dates.		1895.
EUROPE—			
Russia	42,301,973		
United Kingdom ..	31,751,777		
France	17,456,380		
Spain	15,471,183		
Italy	11,160,420		
Turkey	10,000,000		
Austria-Hungary ..	10,706,980		
Bulgaria	8,130,997		
Germany	7,703,710		
Roumania	5,655,444		
Portugal	3,150,000		
Greece	4,568,168		
Servia	3,160,166		
Norway	1,398,488		
Sweden	1,010,217		
Finland	937,565		
Denmark and Iceland ..	1,371,880		
Netherlands	606,785		
Switzerland .. .	585,029		
Montenegro .. .	400,000		
Belgium	235,722		
		177,757,834	198,194,214
AUSTRALASIA . ..		116,034,173	110,561,381
SOUTH AMERICA—			
Argentine .. .	60,000,000		
Uruguay	26,286,296		
Chili	4,224,266		
Falkland Islands ..	688,705		
Colombia	746,000		
Other States .. .	400,000		
		92,345,267	102,847,134
NORTH AMERICA—			
U.S.A. .. .	57,216,000		
Mexico	3,424,430		
Canada	2,598,470		
Newfoundland	78,052		
Other States . .	150,000		
		63,466,952	57,158,600
AFRICA—			
Algeria	9,632,177		
Cape of Good Hope ..	18,807,168		
British East Africa ..	5,105,000		
Orange River Colony ..	7,481,251		
Transvaal	3,011,906		
Natal	1,068,996		
German East Africa ..	1,560,000		
Rhodesia	200,000		
Sudan	1,421,721		
Tunis	833,562		
Other Africa	500,000		
		49,021,781	31,890,052
ASIA—			
Turkey in Asia	4,500,000		
Russia in Asia	20,063,327		
British India	18,033,035		
Ceylon	96,335		
Japan	4,085		
Cyprus	300,000		
		83,496,782	21,957,752
Total		582,722,789	522,609,088

Population Figures.

	Latest Dates.		1895.	
EUROPE—				
Russia	155,433,300		127,000,000	
Germany ..	62,982,000		52,758,000	
Austria-Hung.	50,816,092		43,696,000	
U. Kingdom .	45,008,421		39,599,000	
France	39,267,000		38,518,000	
Italy	34,269,764		31,506,000	
Spain .. .	19,712,585		18,238,000	
Belgium ..	7,386,444		6,496,000	
Roumania ..	6,771,732		5,710,000	
Netherlands ..	5,825,198		4,929,000	
Portugal ..	5,197,000		5,280,000	
Sweden ..	5,429,600		4,963,000	
Bulgaria ..	4,158,409		3,441,000	
Switzerland ..	3,559,349		3,151,000	
Servia .. .	2,784,000		2,846,000	
Greece . .	2,631,952		2,434,000	
Denmark ..	2,737,470		2,306,000	
Norway .	2,352,786		2,126,000	
Bosnia	1,750,000		1,600,000	
Crete	350,000		295,000	
Cyprus ..	258,997		......	
		458,682,099		396,387,000
AFRICA—				
Cape of Good Hope ..	2,507,600		580,000	
Algeria ..	5,231,850		500,000	
Tunis ..	2,000,000		10,000	
Transvaal	1,355,442		300,225	
Natal ..	1,206,386		64,000	
Rhodesia .	1,604,875		. ....	
Orange River Colony ..	466,320		143,000	
Egypt . ..	113,000		113,000	
		14,485,433		1,710,225
N. AMERICA—				
United States ..	87,189,000		70,254,000	
Mexico	13,605,919		13,607,000	
Canada ..	6,945,000		4,834,000	
Newfoundland	237,047		200,000	
		107,976,966		88,895,000
S. AMERICA—				
Brazil .	21,531,100		14,834,000	
Argentine	6,805,684		4,048,000	
Chile ..	3,302,204		3,009,000	
Peru .. .	3,500,500		2,661,000	
Venezuela .	2,666,241		2,075,000	
Uruguay .	1,042,688		819,000	
Colombia ..	4,303,000		800,000	
Bolivia. ..	2,049,083		500,000	
Paraguay ..	631,347		500,000	
Guatemala ..	1,882,992		85,000	
		47,714,839		28,867,000
ASIA (Wool-using)—				
Japan	1,010,000		500,000	
India	100,000		97,000	
China	30,000		20,000	
		1,140,000		617,000
Miscellaneous				50,000
AUSTRALIA .	4,450,430		3,183,000	
NEW ZEALAND .	1,007,811		627,000	
		5,458,241		3,810,000
Grand Totals .. .		635,457,578	.. .	520,336,225

The Prickly Pears of Interest to Australians.

J. H. MAIDEN,
Government Botanist, and Director of the Botanic Gardens, Sydney.

3. **Opuntia nigricans,** Haworth.

(The *Opuntia Tuna* legislated against in New South Wales.)

I HAVE already stated (No. 1 of this series, p. 326 of the *Agricultural Gazette* of April, 1911), that *Opuntia Tuna* is legislated against; see *Government Gazette* Notice of 15th March, 1887, issued under authority of the "Prickly Pear Destruction Act of 1886." The identification of *O. Tuna* has, therefore, a very practical interest for us in this State.

What is *Opuntia Tuna*? Let me say straight away that the plant I have figured, *Opuntia nigricans*, is the plant referred to in the *Government Gazette* notice aforesaid.

O. horrida, Salm-Dyck, according to Don's General History of Dichlamydeous Plants, iii, 173, "often occurs in the gardens under the name of *O. Tuna*." He also says that *O. humilis*, Haw., is the same plant as *horrida*, and adds that the name *humilis* (low-growing) "is deceitful, the plant growing to a considerable height." *O. horrida* and *O. humilis* are the same as *O. nigricans*.

Nicholson (Dictionary of Gardening, Suppt. 1900, p. 570) and Britton and Rose (A Preliminary Treatment of the *Opuntioideæ* of North America; Smithsonian Miscellaneous Collection, L. [1908]) say that *O. humilis* is a synonym of *O. nigricans*.

Britton (*op. cit.*) says that *O. polyantha*, Haw., is one synonym of *O. Tuna*.

O. Tuna, Mill. (*O. horrida*, Salm.), poorly figured in Bailey's Cycl. of Amer. Hort. p. 1147, fig. 1,545, is our *O. nigricans*.

Schumann (Gesamtbeschreibung der Kakteen, 724), noted that by *O. Tuna*, *O. Dillenii* is meant, and I believe that is the view held by some people in Queensland.

In this *Gazette* for September, 1898, I have discussed the question as to the identity of *O. Tuna*, without coming to absolute finality; while A. Berger, one of the best authorities on the genus, commenting on my paper, in Engler's *Jahrbuch*, xxxvi, 455 (1905), made use of the remarks—"What then is *O. Tuna*? It hangs in the air like a spectre; everybody talks about it, but nobody has seen it . . . . Would it not be advisable to drop it altogether, this old spectre-like *O. Tuna*, this great unknown?"

So that when *O. Tuna* is referred to, it may mean one or more of the following (N.B.—These are not all synonyms, *e.g.*, *nigricans* is quite different from *Dillenii*):—

Opuntia nigricans.
" *horrida.*
" *humilis.*

Opuntia polyantha.
" *Dillenii.*

A Plant of *Opuntia nigricans* at Windsor, N.S.W.

PRICKLY PEAR

I could give other names, but more would seem unnecessary in this place; and lest any of my readers may be tempted to carelessly use the name *Opuntia Tuna,* I would say that the study of *Eucalyptus* and *Acacia,* Australia's largest and most complex genera of plants, is child's play as compared with *Opuntia*; while of *Opuntias,* the one which has given me most trouble has been the so-called *Tuna.*

I may point out that the word *Tuna*, in Mexico, is the ordinary word for the fruit of such species as have joints approximately similar in shape to the one depicted on the Plate, so that the word itself does not help us much.

Following is a description of the plant (drawn up from Sydney specimens):—

Size.—Usually about 6–10 feet high, branching. One of the spiniest of prickly pears, although the individual spines of some others are more formidable.

Joints.—Up to 15 inches long (average, 11 inches), and 7 inches broad (average).

Spines.—Up to 2¼ inches long. I have counted up to thirteen in a fascicle, and eight and more in number are common. One spine in a fascicle is usually much stronger than the others. Yellowish in colour, white when past maturity, sometimes black. The joints fully armed on both sides.

Bristles.—The bristles in brown tufts on the fruits, which are nearly as bad as those of *O. monacantha* in that respect.

Fruit.—Shape somewhat pyriform. Of only moderate size (1¾ inches x 1¼ inches) for an *Opuntia.* Borne in large numbers, and frequently on the flat sides of the joints, and not solely along the edge, as is usually the case in *Opuntias.* Rich crimson (carmine). The flesh of a similar colour, or redder.

Flowers.—This species is readiest known (amongst the larger ones) by the colour of its flowers, which vary from yellow and orange-yellow to rose-pink. No other species which has run wild in Australia has flowers like it. The protrusion of the stigma in this species indicates this as one of the species of *Opuntia* which shows transition to *Nopalea.*

From both the coloured plate and the photograph, it will be seen that this pear is exceedingly formidable, but it does not spread with the aggressiveness of the Pest Pear. Again, the individual plants are larger and more separate, and so the enemy can be poisoned one by one, and thus disposed of.

But while it is not so much feared as the Pest Pear, my advice is not to allow it to spread.

Habitat.—It is a native of Central and South America, and has been introduced into many tropical and sub-tropical countries.

In our own State it is common at Windsor and at Gungal (between Muswellbrook and Merriwa), particularly on the hills.

In Queensland (so Mr. Boorman tells me) it occurs at Yelarbon, in the south-west of that State, and I shall be glad to learn of additional localities in both States.

Introduction of Prickly Pear into Australia.

In 1788 the East India Company gave sealed orders to the captains of some of their ships proceeding to the Brazils to procure the Cochineal insect if possible (Burkill, Rec. Bot. Survey of India, iv, 295). In the meantime Dr. James Anderson prepared at Madras an *Opuntia* garden for their reception, chiefly with an *Opuntia* procured from His Majesty's garden at Kew, through Sir Joseph Banks.

The year before (1787) Governor Phillip had sailed for these shores; and, bearing in mind the solicitude of the British Government to obtain the true Cochineal insect and to establish a sufficiency of food for it, it is in the highest degree probable that Sir Joseph Banks, who was the principal scientific adviser of the Government, would inform Governor Phillip of the cochineal proposals, which, as regards Spain's possessions, had to be carried out with secrecy.

The tangle of early *Opuntia* nomenclature is such that it is quite impossible to say what species were taken by Governor Phillip from Rio de Janeiro for the infant settlement of New South Wales. We may be certain that, with the great mortality of plants inevitable in so long a voyage performed under such circumstances, the Prickly Pears triumphantly survived the voyage, and those forms are their descendants which are now acclimatised in the vicinity of Port Jackson and Botany Bay.

Addendum.

With reference to Article No. 1 (*Gazette* of April, 1911), Mr. J. L. Boorman informs me that *Opuntia aurantiaca* has got a good hold in the Waterworks area, Warwick, Queensland.

LACTIC ACID CULTURE FOR WHITE SCOUR IN CALVES.

THE Bureau of Microbiology has received a report from Mr. Giles Moore, of Guyra, who tried this remedy. The cultures were supplied weekly from the Bureau from the 15th November, 1911, until no further supply would be required. The matter is explained in the *Gazette* for November, 1911, page 984.

On 15th January, 1912, Mr. Moore stated:—

> I have found the Lactic Acid Culture very effective in the prevention of scours. We had only three calves die out of about forty-five. I find that if you mix a cupful of flour in the milk when the calf gets sick first it is very effective.
>
> You need not send any more, as the calves are all fairly big now.

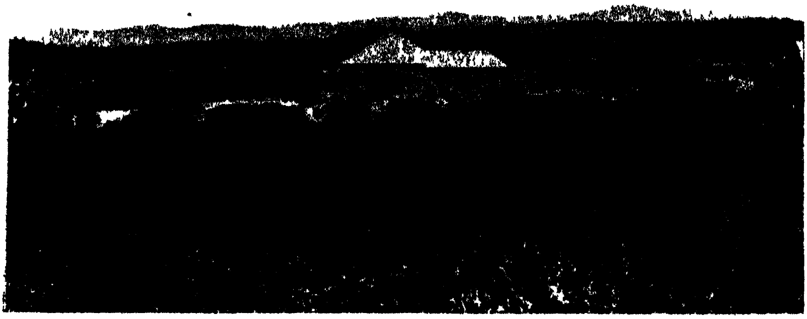


Photo. by George Marks.

An Improved Dairy Farm on the Dorrigo.

Balanitis in Sheep.

CHARLES J. WOOLLETT, Inspector of Stock, Cobar.

THIS trouble amongst sheep (wethers) is very widespread in this district, and is of great economic importance, inasmuch as wethers affected never fatten, while numbers die; and, furthermore, there is a material depreciation in the quality of the wool. Taking this district generally, the approximate estimate of the number of wethers affected would be between 5 and 8 per cent. at least.

The trouble is rarely met with in rams, although out of eight old rams in a pen at a station in this district, five on examination were slightly affected. These rams had not been worked for several months, and were broken-mouthed. Wethers of all ages are affected, but the trouble is most frequently met with in six and eight-tooths.

Altogether I have examined about 1,000 wethers with the affection in all its stages. The condition most frequently met with is a scab covering the orifice of the prepuce, through which the urine oozes. The scab is generally encrusted with dirt, and the sheath presents an ulcerated surface when the scab is removed. The sheath is always swollen and inflamed, and inside contains a thick glairy substance the colour of pus, mixed with urine, and of a most disagreeable odour.

In advanced cases the sheath is sometimes found sloughed off for a couple of inches. Where treatment by slitting has been adopted—a treatment much to be deprecated—you sometimes find on the floor of the abdomen a slough with a raw surface and fly-blown.

Machine-shorn sheep are found more frequently affected than hand-shorn, the proportion being fully 8 to 1. The proportion of machine-sheds to hand-sheds here is about 3 to 1.

It is a very noticeable feature that in a great number of cases of balanitis, or "big pizzle," a tuft of wool was left about the prepuce during shearing. This wool is naturally always wet. Another observation was that there is a very appreciable difference in the size of the orifice of the prepuce, and in cases where this phenomenon could be looked into, the size of the affected sheath was always on the small side. Rarely would a sheep be found affected that had a clean pizzle free from wool. In the few such cases observed the orifice was small. It was frequently observed also that the draining hairs from the sheath were cut off, and further, that sometimes grass seeds were found stuck into the prepuce.

I have inoculated sheep with cultures of organisms obtained from the matter contained in the sheath, but failed to set up the disease. Pus inserted into the sheath of healthy wethers also failed to produce the trouble.

The wool left about the sheath is always wet, and, of course, scalds the part, resulting in a certain amount of inflammation, with a slight closure of the prepuce as a corollary. Being more or less inflamed or swollen, the part is more prone to be scratched with sticks, grass seeds, &c., resulting in sores. The penis is a short distance from the prepuce, and, consequently, there is a pocket of urine in the sheath between the penis and the prepuce. As sheep lie down on the camps, dust collects about the damp wool and sheath, with the result that the bacteria from the dirt find their way into the urine in the sheath and cause decomposition. This continually going on, the "pocket" becomes full of mucus and the results of decomposition. The free drainage being blocked, the prepuce and wool will become more soiled with urine and dirt than ever. The dirt gathering about helps the formation of a crust on any sores. These conditions becoming aggravated, we get typical balanitis.

Treatment.

Many managers have good results from the simple treatment of shearing the wool from around the penis, squeezing the sheath and liberating the contained matter. The prepuce is then washed with such substances as arsenic water, sheep dip, Stockholm tar, and kerosene. In probably 80 per cent. of cases a cure is effected. This result might be explained by the fact that the dirt and scab are removed, and a channel for urine provided. The cause of the irritation being removed, medicaments are applied that help to heal sores and allay the inflammation, and then Nature asserts herself.

A device recommended by me and found very effective is as follows:— A large bicycle pump has a tapering nozzle about 2 inches long soldered on to it, small enough to be inserted into the sheath. The piston should be altered so that it will suck up fluid. After shearing the stained wool from around the prepuce, and squeezing out the pus as much as possible, the syringe is filled a couple of times with a strong solution of Condy's fluid or arsenic water, and injected into the sheath. Condy's crystals and arsenic are recommended on account of their cheapness.

Prevention.

Prevention is better and cheaper than cure. Shearers should be required to take great care about getting the wool off around the sheath. Again, other things being equal, rams with large orifice of the prepuce should be selected in preference to those with small openings, if there is anything in the expression that *like begets like.*

Is Federation Wheat Degenerating?

J. T. PRIDHAM, **Assistant Wheat Experimentalist.**

FROM the fact that slight modifications of form in this wheat are noticed from time to time, it has been thought by some that it has had its day, and is reverting to a wild state, on the same analogy as that Algerian oats is supposed to "throw back" eventually to the black wild oat if grown continuously without change of seed.

Variation in height of the plants of Federation was first noticed by the writer in a field crop of this variety at the Bathurst Experiment Farm in 1904 or 1905. But no further variations were met with until 1908, when Assistant to the Field Superintendent in Victoria. At the Longerenong College, Dooen, a small crop of Federation was examined in that year, and three plants differing from the regular type were found:—

(1.) Heads of usual length, with spikelets crowded together at the tip;
(2.) Heads short, with spikelets crowded throughout;
(3.) Heads of usual length, showing beards at tip.

Grain from these plants was sown in three separate rows, close to a row of the ordinary Federation; and in 1909, the "sports" persisted in each case, the respective plants breeding true to the types seen the previous year. The heads were brown, and the foliage similar in each case to Federation, with stiff, rather short straw, the shortest stalks being produced by No. 2 plant.

Selections from the produce of plants Nos. 1, 2, and 3 were sown in 1910, and again the "sports" respectively bred true. In this year, also, a number of single plants harvested in 1909 from a field crop of Federation were sown in separate rows, some with more or less crowded heads, and some with a slight beard at the tip. These various types bred true, but were not further propagated, as they showed no superiority to the regular type of Federation.

Mr. Peacock, the manager of the Bathurst Experiment Farm, was asked his experience with Federation in this respect, and replied as follows:—

> I have always noticed an instability with this variety ever since it has been grown here. The most noticeable variation was that of some plants being much taller, yet possessing the district Federation type in other respects. We find a good many variations in our stud bulk sowings. Some vary in being taller than others; some have whiter glumes; some with fairly long awns; some with more compact, club-shaped ears; and others with less compact ears than the true type. I cannot state whether any have really come true to type completely. I have not received any complaints from farmers as to the variability of this variety.

Mr. Sutton, the late Wheat Experimentalist, was quite aware of the fact that Federation showed these slight variations, but provided that the yielding qualities and the flour strength were maintained, and that the variations were not wide enough to endanger the identity of the wheat, he was content to overlook them, considering utility of more importance than "feather points."

The Manager of the Wagga Experiment Farm, Mr. G. M. McKeown, states:—

> Variations were noticed by the Experimentalist in the plots this year when the chaff began to colour. Some had typical Federation heads, excepting colour of chaff. He cannot say if they breed true or not. Variations were also noted in the field crops, a considerable number of ears of much greater length than usual being present, the colour, however, being normal. In a sample recently received from a farmer for identification, two types were present—one of which was lighter in colour and had the glumes much more closely set than is usual in the old type.

At the Cowra Experiment Farm this season we had three strains sown which showed variations. It should be explained that these strains each sprang from a single individual plant, and every year the six best plants from each strain are sown in separate rows. The seed from each plant is thus kept pure, and any departures from type can easily be seen, the seeds being dropped singly 6 inches apart in the rows.

No. 1 strain, in one of its rows only, showed a number of variations in closeness of spikelets and breadth of head, but not in colour.

No. 2 strain produced variations in two rows. No. 2 strain, as it happens, has creamy-coloured heads, and in the same row was found a brown-headed plant, also one with curved, cream-coloured, tapering heads. From the other varying row of this strain two plants which differed from the type were removed—particulars not noted.

No. 3 strain presented a somewhat piebald appearance in the widely spaced rows (though this was scarcely noticeable in a field crop sown with the same seed). Some of the plants had creamy heads, but the greater number had brown heads characteristic of Federation. The plants in each row were counted, with the following results:—

Row	16	yielded	16	plants with	creamy heads and	66	plants	brown.
,,	17	,,	24	,,	,,	68	,,	,,
,,	18	,,	19	,,	,,	69	,,	,,
,,	19	,,	19	,,	,,	66	,,	,,
,,	20	,,	29	,,	,,	73	,,	,,
,,	21	,,	15	,,	,,	64	,,	,,
,,	22	,,	22	,,	,,	76	,,	,,
Average			20·57	,,	,,	68·85	,,	,,

It might be thought that natural crossing is responsible for the variations above quoted. But in many cases they bred true, and after a cross it is usual to find more striking differences than were seen last season at Cowra, and an increase of vigour which was not apparent. In the case of creamy and brown heads tabulated above, the only difference noted between the plants was in the colour of their heads. However, the percentages nearly approach the proportions in which characters separate after crossing, according to Mendel's laws, so that in this case the variation may be due to cross-fertilisation.

Besides the appearance of the heads and height of straw, a slight difference in the width and depth of colour of the leaves has been observed, and in the size and shape of the grain. The variations in the grain, however, that have come under notice have in no case been sufficiently marked to cause suspicion as to the purity of the wheat.

Quality of Grain.—The unstable condition of this variety in recent years has afforded a good opportunity for selection in respect of grain quality. According to Mr. Guthrie's milling analyses, the flour strength and quality of Federation are better now than they ever were, though it is true that deterioration in this respect begins so soon as the variety leaves the hands of the wheat-breeder unless proper methods of seed-selection are followed.

It has been said that Federation is "going to pieces"; but in our stud plots at Cowra this season it has out-yielded all other standard varieties, and the grain is of excellent quality, and should yield a flour strength of 50. It cannot be denied that Federation is decidedly rust-liable, takes mildew and flag-smut more than most wheats, and is quite susceptible to bunt; but these shortcomings are outweighed by its heavy yielding qualities. The variations seen from time to time appear to be of little consequence from the wheat-grower's point of view, and, except to the practised eye, would escape notice in a farm crop.

EXHIBITS OF NEW SOUTH WALES GRAIN IN ENGLAND.

THE Agent-General has again written to the Premier emphasising the value of sending exhibits of grain to London. Mr. Coghlan says that the samples sent upon the termination of the Easter Show, 1911, attracted considerable attention in London and Liverpool. Though some were affected by weevils, and could not be used, a very fine display was procured by using samples of the wheat sent from the Experiment Farms, and also maize from such farms and from private growers. Letters are reaching Mr. Coghlan from Malta, Austria, Italy, and other continental countries asking for samples of our grain, whilst the demand from British millers is as great as last year.

The Corn Trade Association in Antwerp have kindly placed a room at Mr. Coghlan's disposal for displaying our wheat and maize. In some places the exhibition is practically a permanent one, and supplies to replenish the stocks on view are forwarded from time to time.

The Department is making arrangements to send a much larger quantity of grain than usual during the coming season. In addition to the Experiment Farms being asked to supply larger quantities, the Inspectors of Agriculture and other field officers have been asked to look out for exhibits of merit.

Farmers and Fertilisers.

[From *Mark Lane Express.*]

A FARMER should first take care that all the farmyard manure produced on his farm is utilised, and should see that this valuable source of fertility is not wasted. It is a good thing if he can improve the quality of the manure by feeding with cakes, &c.

When he has estimated what supplies of fertilising material he has from this source he is in a position to calculate how much commercial fertiliser is required to supplement the farmyard manure, and he will remember that a liberal supply of suitable nourishment to his crops is just as good policy as a generous supply of food to his stock. Then, after consideration of the condition of his soil and the requirements of the crops he is going to grow, he can decide what fertiliser he requires, and which sort is the most advantageous in view of the current market price of the different kinds.

The farmer who carefully studies all the sides of the matter, and uses commercial fertilisers with discrimination, is the man who gets a profit out of them, and the farmer who just buys a fertiliser because it is pressed upon him by an enterprising seller is the man who afterwards says that he does not see any good in chemical manures.

World Production of Fertilisers.

By a glance at the enormous quantities of artificial fertilisers employed in the world, one can get a good idea of the general progress of agriculture. The figures cannot be more than approximate, but they serve to show how dependent agriculture has become upon the fertiliser industry.

1. *Phosphate of Lime.*—The total production is estimated at about 10,000,000 tons, of which 8,000,000 may be attributed to superphosphate, and 2,000,000 to basic slag. This does not include the large quantities contained in guano, bones, &c.

2. *Potash Salts.*—The Stassfurt mines deliver potash salts in different forms equal to about 500,000 tons of pure potash.

3. *Nitrate of Soda.*—The shipments of this commodity from Chili amount to about 2,000,000 tons a year, of which it is roughly estimated that three-fourths are for agricultural and one-fourth for chemical industries.

4. *Sulphate of Ammonia.*—The total production approaches 1,000,000 tons a year, which is employed for agricultural purposes.

All this fertilising material is transformed by processes of cultivation and nature into supplies of food for mankind and stock; yet experts tell us, that as time goes on and cultivation becomes generally more intensive, it will be necessary to employ far larger quantities of fertilisers. Will the supply equal the demand? There are already indications that prices are moving up, because the supplies are not keeping pace with the inquiries.

How Bones are collected in Arabia.

The advance in the value of bones has caused their collection in out-of-the-way places of the world to be carried on with greater activity. Thus it is reported that the trade in bones from Arabia is increasing. The bones are shipped to Germany, France, and England. Some parcels even find their way to America.

The bones collected in the Somali district of Arabia are of two classes, those gathered from the surface being clean and white, while those dug out of the ground are more or less yellow.

The native Arab traders buy the bones from the poor women of the district, paying about 33s. per English ton, and the bones are then loaded on to camels for transport to the nearest shipping place. A camel can carry a load of 336 lb. The bones are then bought by the merchants who ship them. Merchants have sometimes tried to deal direct with the poor women who collect the bones, but have found it a far more costly system, as the women prefer to deal with the Arab traders, and the traders do not make inquiries as to the origin of the merchandise.

Phosphate of Lime necessary for Bone Structure.

It may be taken as an axiom that pastures and hay lands poor in phosphate of lime cannot support stock in a healthy condition. A striking example of this fact has been supplied by a district in France where the soil was naturally lacking in phosphate. For a long period up to about the year 1880, the cattle in the district of Gâtinais were decimated by bone diseases. Efforts were made to improve their condition by giving them doses of phosphate, powdered bones, and similar materials as a medicine, although without any marked success, and it was not until the use of phosphatic fertilisers became general in the locality that any marked diminution in the disease could be observed.

Before 1880 the cattle, according to records, did not average more than 800 lb. in weight, and furnished only about 3 pints of milk, whereas, at the present time, the weight of the cattle frequently exceeds 1,000 lb., and the milk yield has increased to 4¼ pints.

Formerly the cattle presented to the eye an appearance of lassitude and indolence, and the mortality sometimes amounted to 15 per cent. on a farm.

Now their appearance denotes strength and activity, and the mortality has declined to 2 per cent.

These changed conditions are ascribed in the report, from which we have taken the details, to the regular application to the pastures and hay lands of phosphatic fertilisers, which have enabled the soil to produce forage more abundant, and richer in phosphate of lime.

Lime for Agricultural Purposes

There is lime and lime; lime properly adapted for agricultural purposes, and lime not suitable for application to the land. This month's Journal of the Board of Agriculture has a paragraph on the subject. A case lately came to the notice of the Board in which a grey lime was sold for agricultural purposes, which proved on analysis to contain, in addition to 68 per cent. of lime and 1·33 per cent. of magnesia, as much as 16·6 per cent. of insoluble siliceous matter. While such a lime would be suitable for building purposes, it would be quite unsuitable for use on the land, as, on being wetted, it would tend to set like cement. It is doubtless unusual for lime having so large a content of silica to be sold for agricultural use, as purchasers would readily detect its unsuitability for slaking, but farmers would be well advised when buying this material to ask for a statement as to the amount of siliceous matter present. In purchasing burnt lime, quicklime, limeshells, or caustic lime (all terms for one and the same material), a guarantee should be obtained that it contains not less than 85 per cent. of pure lime and not more than 4 per cent. of magnesia. It may be noted in this connection that the expression pure lime, oxide of lime, oxide of calcium or calcic oxide, sometimes made use of by sellers of lime, all have the same meaning. Ground lime consists of burnt lime ground to a fine powder, and should be similar in quality to quicklime. Ground limestone, on the other hand, is limestone rock—that is, more or less pure carbonate of lime—ground to a fine powder. When the purer limestones are used for this purpose, the percentage of carbonate of lime may be expected to exceed 95 per cent.

Lime carried off by Crops.

There is a continual drain on the stock of lime in the soil by the crops; thus the following crops, including grain and straw, carry off respectively :—

Wheat ...	25 bushels	13 lb.
Barley ...	40 ,,	17 ,,
Oats ...	50 ,	22 ,,
Turnips ...	20 tons	118 ,,
Potatoes	8 ,,	40 ,,
Red clover	2 ,,	77 ,,
Rye grass	2 ,,	30 ,,

The above quantities are not constant, and much of the lime may be returned to the land in the straw, the tops, and the manure; but still the land cannot fail to suffer a certain annual loss of lime from the above cause.

ENTOMOLOGICAL RESEARCH.

THE Imperial Entomological Research Committee has proposed that the various States and Dominions of the British Empire should contribute the sum of £1,000, so that all the latest discoveries and notes from all parts of the Empire may be published by a central staff in London. Mr. W. W. Froggatt, our Government Entomologist, suggests that the matter might take the form of a quarterly Bulletin, like the Experiment Stations Record of the United States. The bulk of the information would probably be furnished by Australia, Africa, and Canada.

An Entomological Congress is being held at Oxford, England, in August this year, under the auspices of the Entomological Society of London.

IMPORTED LUCERNE SEED IN THE WEST.

IN the *Gazette* for October, 1911, preliminary results were given of a number of trials with imported lucerne seed. Included in the reports was one by Mr. M. H. Reynolds, then Inspector of Agriculture, of trials conducted upon the farm of Mr. V. D. Cox, Burrundulla, Mudgee; and it was also stated that arrangements had been made with the Manager of Towri Estate, Maryvale, to sow some seed. Mr. Reynolds has now furnished further reports respecting these trials.

MUDGEE.

The results of this trial up to May, 1911, are given in the *Gazette* for October, 1911, page 905. The lucernes were again cut for hay on 25th September and 30th October, 1911.

On 7th December, sections of each variety were cut and weighed green, a proportion of the plants being in flower. On the 10th December the hay was weighed. Mr. Cox considered that when the weights of hay were taken, the hay was not fresh enough to sweat when stacked. The results were as follow:—

Variety.	Yield per acre.					
	Green lucerne			Lucerne hay		
	t.	c.	q.	t.	c.	q.
Red Provence	6	11	1	1	12	3
Queensland	6	0	0	1	7	1
Hunter River	5	18	2	1	8	2
French	5	7	0	1	5	3
Turkestan	4	9	1	1	0	0
German	4	3	2	Not weighed		

From these results, Red Provence is worthy of further extended trials in competition with Hunter River seed.

MARYVALE.

As indicated in October *Gazette,* page 906, plots were sown at Towri Estate, Maryvale, on 20th to 23rd May, 1911. On 28th August, after a very severe winter, Arabian had produced best growth, 4 inches high, but there was only a single stem from each seed. Peruvian came next, but was more bushy: then Montana. Sand and Turkestan were just above ground, but bushy. Turkestan had been constantly cut down by severe frost during the winter. The plot of Hunter River was only just up, having been sown on 7th August.

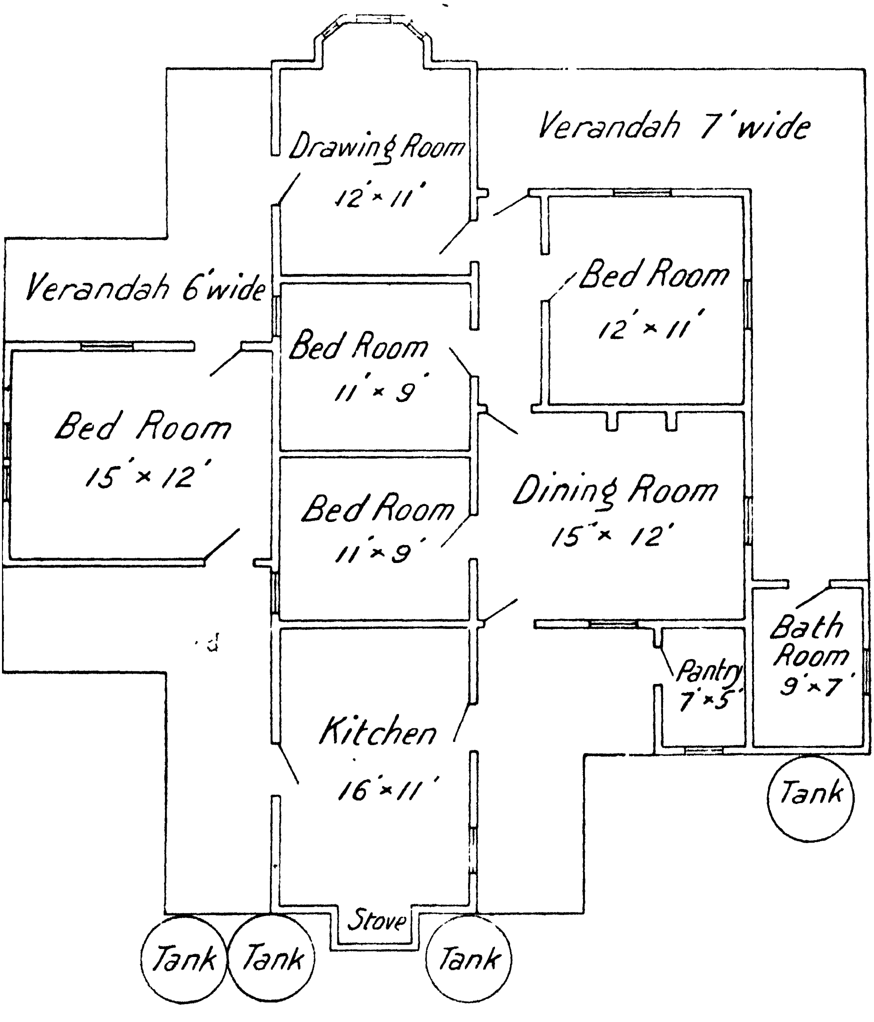
On 14th September, the Arabian was 6 inches high, still single stems but very broad leaves. Peruvian was 3 to 4 inches high and stooling well. Montana was 2 to 4 inches high and stooling fairly. Sand and Turkestan were 2 inches high, and bushy. Hunter River had made little growth, being only 1 inch high.

So far, Arabian has proved the most promising variety for winter and spring growth, the next best variety being Peruvian, and then Montana. Weather conditions have not been favourable for a satisfactory hay yield since planting, but this year it is proposed to weigh the entire product of each cutting.

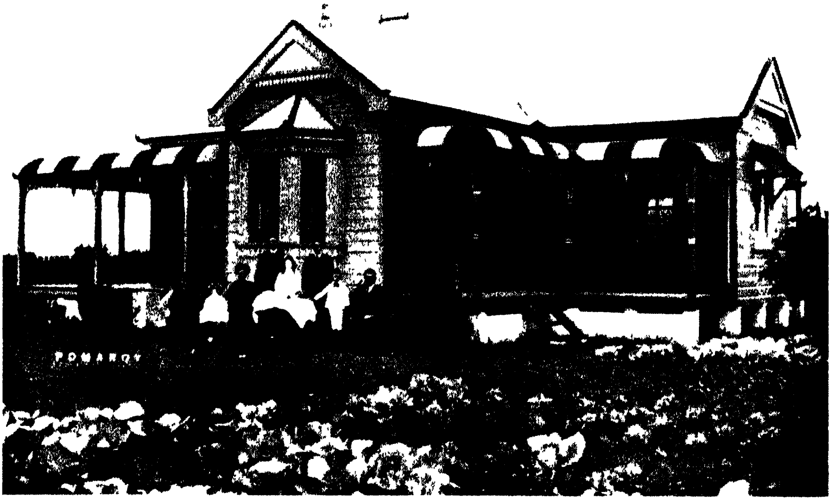
Attractive Rural Homes.

5. Mr. James Cooney, Lawrence.

LEAVING historic Hawkesbury, we come now to a fine little piece of architecture on the Clarence River. Mr. Cooney informs us that the dwelling shown on the plate cost him but £400. Many farmers in various parts of the State have expended that sum and more upon structures which, through



Ground-plan of Mr. James Cooney's residence, "Pomaroy," Lawrence.



"Pomaroy," residence of Mr. James Cooney, Lawrence.

"Hazeldene," residence of Mr. John Robson, Tumut.

ATTRACTIVE RURAL HOMES.

want of knowledge or want of taste, have injured rather than improved the landscape of their districts. We have, therefore, much pleasure in publishing Mr. Cooney's plan, and we commend it to *Gazette* readers as something worthy of imitation, or of forming the basis for designing a home to meet requirements.

Mr. Cooney has a rather large property, totalling, with outside paddocks, 850 acres. He is a dairyman, and also engages in mixed farming and cattle and horse raising.

As a shade tree for the Clarence district, Mr. Cooney recommends the camphor. This tree, a native of China and Japan, appears to be specially suited to subtropical districts of fair rainfall. It is an evergreen, fast-growing, wide-spreading tree, and can be propagated from either seed or cuttings.

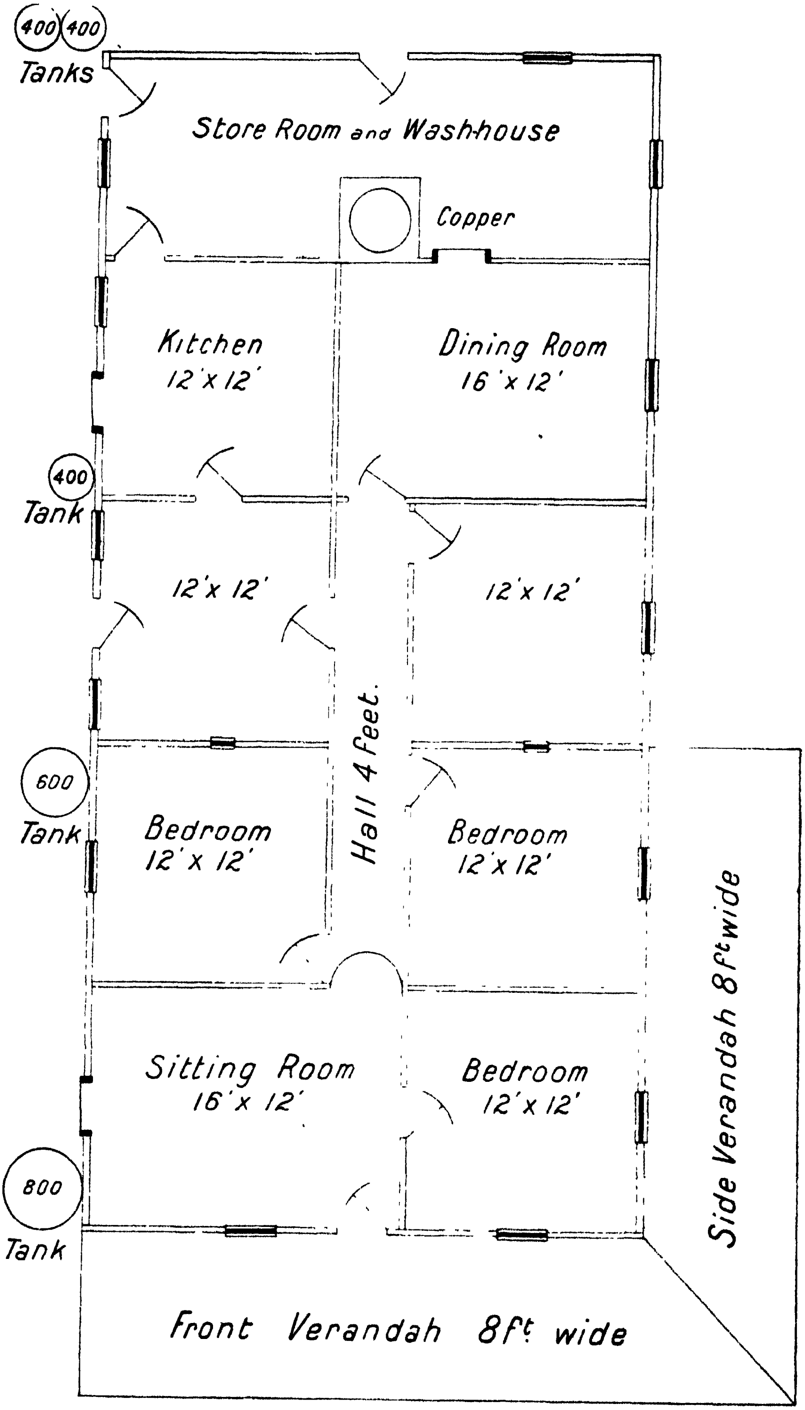
6. Mr. John Robson, Tumut.

Mr. Robson is a railway guard on the Tumut line, and has obtained a small farm of 25 acres with a view to providing himself with a home when he reaches the age at which he must retire from the railway service. His spare time, about three hours each alternate day of the week, is devoted to assisting his son in working the little farm. He has an orchard and vineyard of about 7 acres, and also grows a small area of crop, chiefly oats. The land was very rough, and covered with stumps and dead timber when he took it up five years ago, but it now promises to return him a fair margin of profit for his labour.

As will be seen from the plan, the house has been extended since it was first erected. The profusion of creepers and shrubs give it an attractive appearance. The architecture is very simple, and the home is not an expensive one, but it is roomy and comfortable, and is regarded in the district as setting a standard to which others could and should attain.

INTER-POLLINATION OF APPLES.

MR. W. J. WRIGHT, of Pambula, referring to this subject, says that there is an apple-tree in his neighbourhood 6 chains distant from any other fruit-tree, which bears enormous annual crops of splendid fruit; also a pear-tree three-quarters of a mile from any other fruit-tree, which has this year fully half a ton of splendid fruit. The Fruit Expert of this Department states that instances, such as this, do occur of fruit-trees fruiting heavily when practically isolated. This fact is explained through some varieties of apples and pears being self-fertile, *i.e.*, being able to fertilise their own flowers.



Ground-plan of Mr. John Rotton's residence, "Hazeldene," Tumut.

The Repression of Tuberculosis in Dairy Herds.

J. DOUGLAS STEWART, M.R.C.V.S., Professor of Veterinary Science, University of Sydney.*

TUBERCULOSIS has been recognised as an infectious disease for many centuries, and the discovery of the causal agent—the tubercle bacillus—by Koch in 1882 made possible the more exact study of its nature. Since then, an enormous amount of research has been carried out by many eminent scientists with respect to the life-history of this bacillus, the forms which it assumes in various animals, and on artificial cultivation, the variation in virulence of its different forms, and the conditions of disease to which it gives rise in different infected animals. Tuberculosis has a wide zoological range, and the fact that it is so fearful a scourge to mankind materially enhances the importance of the repression of the disease in domestic animals.

It is generally admitted that one of the most prolific sources of dissemination of the disease is milk from a cow suffering from tuberculosis of the mammary gland. As the dairy cow is notoriously susceptible to the disease, the repression of tuberculosis in these animals constitutes part of any general scheme evolved for stamping out the disease. It is, in fact, an essential part, and one that demands the attention of the State and of the individual; the efforts of the one cannot succeed without the co-operation of the other.

The object of this paper is to review generally some of the methods in operation in different countries, and to endeavour to impress upon owners and breeders of dairy cattle that the repression of tuberculosis should be considered a personal matter, as much benefit will accrue to themselves in particular and to the community in general by improving their methods of animal husbandry.

Tuberculosis may be acute and progress rapidly from infection to death. In dairy cattle it is commonly an insidious, slowly progressive disease; its early stages being rarely disclosed without the aid of the tuberculin test. It may attack, and remain confined in, one part of the body, or attack several parts successively or simultaneously. When slight, recovery may take place. Should it extend, the manifestation of symptoms is largely dependent upon the importance and seat of the part attacked. In some cases the symptoms manifested clearly indicate the existence of the disease, but frequently cattle are extensively affected, yet apparently enjoy good health and retain a well nourished condition. Consequently, external appearances cannot be relied upon as an indication of freedom from tuberculosis.

It has been demonstrated that an apparently healthy cow may in reality be a dangerous source of infection, as virulent tubercle bacilli may be discharged from her mouth, nose, and vulva, expelled with the dejecta from her bowels, and occasionally passed out in her milk. The extent to which tuberculosis prevailed in dairy herds was not recognised until the tuberculin test became extensively applied. In some countries as many as 80 per cent. of a herd have proved affected. In this State, one is not surprised to find that from 20 to 30 per cent. of an apparently healthy herd react to the test.

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* Read before the Australian Association for the Advancement of Science, January, 1911.

Tuberculin was discovered by Koch in 1890, and introduced by him as a curative agent for consumption in man. As such it did not realise the expectations at first anticipated, but it has proved of inestimable value as a diagnostic agent for tuberculosis. Tuberculin is a fluid which contains the toxic products of tubercular bacilli, and which has been subjected to great heat to destroy all germ life, and passed through a porcelain filter to remove the dead germs. Before being placed upon the market for use, its strength is carefully standardised.

The value of tuberculin as a diagnostic aid was speedily recognised by veterinarians. Its application soon became extensive throughout the civilised world, and an immense number of cattle have now been subjected to it by many accurate and capable observers. In 1898 Nocard was able to state in precise terms that "the observation to a clear reaction to tuberculin is unequivocal." According to Melvin, out of 23,869 reacting animals slaughtered, lesions of tuberculosis were found in 98·81 per cent. In these cases the test was applied in a practical manner; and when one considers the possibility—admitted by all experienced observers—of the existence of undisclosed lesions in those cases where positive indication of the test was not confirmed on *post mortem* examination, the wonderful accuracy and reliability of the test, when properly applied, is unhesitatingly admitted It is well known that sometimes the lesions of tuberculosis are very minute, and may be located in an unusual deep-seated part, and their revealment demands prolonged and careful search. Occasionally the lesion may be too minute to be discernible by means of the unaided eye, and its presence demonstrable by laboratory methods only. Consequently, scientists of extensive experience are inclined to attribute their failure to disclose the tuberculous part more to their inability than to an erroneous indication on the part of the tuberculin. Yet it is not uncommon to hear a person of no scientific training, and often without even a crude knowledge of anatomy, impugn the reliability of the tuberculin test, because he has failed to detect the existence of the disease on *post mortem* examination. Usually, to such a person the disease is only known in its extensive stage, and his liability to making an erroneous pronouncement with respect to its less evident occurrences is obvious.

The fact that standard tuberculin is an extremely sensitive agent, capable of detecting the smallest lesion of tuberculosis, cannot be too strongly accentuated. Those who have had most experience with tuberculin have failed to observe any injurious effects following its use upon healthy cases, and the statement once made by Hess, that the reaction produced a worse condition in tuberculous animals than before existed, is now generally discredited.

All supplies of tuberculin one may procure have not the same diagnostic value; it should, therefore, not be purchased promiscuously. Even the standard tuberculin is limited in its usefulness, and in some cases its application is contra-indicated. For instance, it gives no indication as to the extent to which tuberculosis affects the reacting animals, and it is inoperative during the period of incubation of the disease and in the advanced chronic stages. To the sanitarian, the fact that an animal does not react to the test during the period that elapses between the time of actual infection and the establishment of the disease, seriously limits the advantages to be derived from the test, and necessitates the systematic re-testing of non-reacting animals, to ascertain whether the disease was latent at the time a previous test was made. Moreover, the susceptibility of cattle to react to tuberculin can be reduced by certain procedures. Consequently, the indication of the tuberculin test should only be admitted when reliable tuberculin is used by capable and conscientious operators under favourable conditions.

The subcutaneous injection is the old and classical method of applying tuberculin as a diagnostic aid. The exhibition of a small quantity, up to ·5 cc., in this manner to a susceptible tuberculous animal, is followed within a short period, usually between the tenth and eighteenth hour, by an increase in the animal's temperature of 2·5 degrees Fahrenheit or more above normal temperature. Fleeting systemic derangement, more or less marked, becomes manifest during the reactional period. The technique of the procedure is not difficult, but requires skill, as its minor points, which are of considerable importance, are apt to be ignored, or at least underestimated by other than trained observers.

Other methods of applying tuberculin to obtain specific reactions for the diagnosis of tuberculosis in apparently healthy cattle have recently been introduced, the more important of which are the endermic method of Vallée; the ophthalmic method of Wolff-Eisner; and the intra-dermic method of Moussu. Various experiments have been made with these new methods, but none appears to be a worthy substitute for the classical method. They may be used in exceptional circumstances, and it would appear advisable to confirm doubtful and negative results by following with the subcutaneous method of injection. Used in association, such as the endermic and ophthalmic methods applied concurrently, the results are more reliable. It has further been found that the ophthalmic method in connection with subcutaneous injection is of use in detecting attempts to render cattle tolerant to tuberculin by repeated dosing.

The value of the tuberculin test as a diagnostic agent having been demonstrated, sanitarians speedily took advantage of its aid, and its application now enters into all effective systems practised for the repression of bovine tuberculosis. The great pioneer in this connection is Professor Bang, of Denmark, who perceived that congenital tuberculosis was extremely rare in calves, and that calves born healthy remained so if preserved from infection; also that new milk very often transmits infection, not only when the udder is attacked, but also from being fouled by the flux of the womb and particles of fæces of highly tuberculous cows.

The following are the principles of the method devised and practised by Bang:—All animals proved to be tuberculous by clinical examination are disposed of; those that react to the tuberculin test are isolated from those that withstand the test, and are allowed to be used so long as they yield sufficient milk, and for breeding purposes. Calves born of cows in the reacting division are at once removed and fed on boiled milk, their mother's milk (raw) being given them on the first day only. Cows of the healthy division are subjected to the tuberculin test once, or preferably, twice a year, and any that react are at once removed. The system of isolation advised is to treat the two divisions as entirely separate herds, so as to obviate direct or indirect contact with one another. In many cases this is found impossible, and the isolation then consists in partitioning off the infected division, and providing separate appurtenances, implements, &c., for each, the attendants keeping two sets of overalls, boots, &c.

Bang was enabled by special Government grant to demonstrate the practicability of his method. The results are certainly convincing: many herds which contained from 50 to 80 per cent. of reactors became in the course of from four to ten years practically free of the disease. It would appear, however, that the success of the method is dependent largely upon the exactness of the testing, thoroughness in isolating the infected, effective disinfection, and the determination and good financial position of the owner. Unfortunately, owing to the limitations of the tuberculin test, some farmers become discouraged upon finding a percentage of the reputed healthy division reacting to subsequent tests. Consequently Ostertag's method, as practised in Germany, finds favour with many, the principles of which are the systematic exact clinical examination of dairy herds for the immediate removal of all cows manifesting symptoms of tuberculosis, the application of the tuberculin test to calves only, and the rearing of calves under conditions which reduce the risk of infection, such as isolation and feeding on pasteurised milk.

In addition to Denmark and Germany, certain of the United States of North America have in operation systems for the eradication of bovine tuberculosis. The States of Wisconsin, Massachusetts, Pennsylvania, and Minnesota are regarded as the pioneers. It may be stated in general terms that their present laws, which are claimed to be the outcome of years of experience, provide for the compulsory testing of cattle introduced for dairying and breeding purposes; the supply of tuberculin by the State; the testing of cattle by trained operators; the safe disposing of reacting animals; and limited compensation to the owners. Judging from a review by Reynolds of the methods adopted by these States, it would appear that, although much good work is being done in reducing the prevalence of the disease, its eradication is by no means within measurable distance, notwithstanding the large amount of public money already expended. Reynolds, taking as a basis for his calculations the number of pure-bred and dairying cattle in each of these States, and the number of animals tested there annually, estimates that at the present rate of progress, to apply the test once to each herd, will occupy thirty-five years in Wisconsin, seventeen years in Pennsylvania, and twenty-four years in Minnesota. Reynolds also states that the personal estimate of the Chief of the Cattle Bureau of Massachusetts is to the effect that there is probably very little being accomplished in the way of eradicating the disease in that State, although the number of seizures has increased.

While the sanitary significance of bovine tuberculosis is recognised in Great Britain more than in most countries, little direct effort has been put forth there to repress the disease. Recently some attention has been directed to what is known as the Manchester method, which consists of taking milk from dealers, centrafugalising it, and injecting the sediment into guinea pigs, and killing them twenty-one days afterwards for examination. Upon positive results being obtained, the herd supplying the milk is subjected to inspection. Professor Boyce, of Liverpool, states that the infected milk supply of that city has been reduced to 6 per cent., but it must be admitted that the method is a very indirect one.

Although bovine tuberculosis is not so serious a disease in the State of New South Wales as in other countries, legislative machinery for its repression has long existed. The provisions of the Imported Stock Act of 1871 prohibited the introduction of other than apparently healthy cattle, and enforced quarantine upon arrival. Subsequent amending legislation demanded that cattle introduced from any foreign country had to withstand the tuberculin test applied immediately prior to shipment. This Act was superseded in 1909 by the Commonwealth Quarantine Act, which provides, in addition, for the official application of the tuberculin test whilst the animals are serving a quarantine period of forty days at the port of arrival, and in the event of a reaction occurring, the chief quarantine officer will decide on the action to be taken, unless the test is supported by one or more clinical symptoms of tuberculosis, certified to by the veterinary surgeon applying the test, in which case the animals shall not be granted pratique.

The existing legislative measures that have to do with the repression of tuberculosis in animals within the State are the "Stock Diseases (Tick) Act, 1901," administered by the Stock Branch, Department of Agriculture, and the "Cattle Slaughtering and Diseased Animals and Meat Act, 1902," and the "Dairies Supervision Act, 1901," administered by the Department of Public Health. Manifest tuberculosis has been declared a disease under the first-mentioned Act, which provides for compulsory notification, the quarantine of infected animals and their destruction by order of the Minister. Every person who wilfully abandons or allows to stray from his charge an animal which he knows to be infected, or who sells, or offers for sale, or purchases, or receives on purchase any stock which he knows to be infected, or who contravenes any of the enactments, is guilty of an offence under the Act, and is liable to a penalty not exceeding £100.

Under the "Cattle Slaughtering and Diseased Animals and Meat Act," Part IV, the definition of a "diseased animal" includes any animal infected with tuberculosis, and sections 47 and 48 provide (*inter alia*) :—

> Whosoever sells or consigns or exposes for sale . . . any diseased beast shall be liable to a penalty not exceeding twenty pounds for each diseased animal sold, consigned or exposed for sale, and to pay any expense incurred in the inspection, seizure, and disposition of such diseased animal, or in the discretion of the Court to pay either the penalty or the expenses aforesaid.
>
> Any person who offers or consigns for sale, or who has in his possession or under his control for sale any such diseased animal shall . . . . be deemed to be a person who exposes such animal for sale.

The Act also provides for the inspection and seizure of any diseased animal, carcase, or meat sold, consigned, or exposed for sale, &c., intended for the food of man, and the Court may condemn with or without seizure and order its destruction. The officers appointed under this Act throughout the State include, in addition to the veterinary staff of the Department of Public Health, Government Medical Officers, Stock Inspectors, officers of municipal and local authorities, officers of police, &c.

The "Dairies Supervision Act" relates more particularly to public health, and does not contain direct power to ensure that none but healthy animals are kept on dairy farms. So far as animal health is concerned, this Act is worked in conjunction with the "Cattle Slaughtering and Diseased Animals and Meat Act." It provides, however, that it shall be unlawful for any person to sell or supply for profit milk or cream, or to manufacture for sale or for supply for profit cheese or butter in any district, unless he is registered in that district. The authorities can, therefore, put it to any dairyman having a diseased beast in his herd that, unless he takes requisite action, his registration will be cancelled, and his business as a dairyman thus ceases to exist. The application of the Act rests largely with the local authorities, and, so far as animal health is concerned, their operations are supervised by itinerant inspectors of the Department of Public Health. While it is recognised that much benefit has resulted from the operations of this Act, with respect to the repression of bovine tuberculosis, it is generally conceded that laxity exists on the part of some of the local authorities concerned, which may be due to either carelessness or inefficiency Apart from the question of the desirability of attaining greater uniformity in the various districts by further legislative enactments, it is considered that greater efficiency is possible in some districts at least by closer supervision, and efficient training of the lay local inspectors. Were all lay inspectors compelled to undergo systematic training of an elementary nature in the diseases of cattle they have to deal with, it is highly probable that, not only would they carry out their duties in a more satisfactory manner, but they would take a keener interest in their work. Still it is freely admitted that the prevalence of tuberculosis in dairy herds has considerably declined since the "Dairies Supervision Act" first came into operation in 1886.

In addition to the benefit derived from official activity, one must recognise the fact that the dairying industry has made rapid progress of recent years, and many astute men are now engaged in it, to whom the economic importance of repressing tuberculosis in dairy cows and pigs is quite obvious.

It might be asserted that the legislative machinery of this State deals with developed tuberculosis, and the influence it has with respect to the repression of the disease is indirect. The beneficial effects of this indirect influence have been greatly diminished by selling agents organising condemned animals compensation funds, to which the owner concerned contributes a small premium for each beast sold, the loss accruing from the condemnation being thus distributed lightly.

As the repression of the disease rests primarily with the breeders, any legislation that relieves them of their responsibility must be regarded as more or less abortive. It is of interest to note that some of the bacon factories decline to pay in full for pigs condemned on slaughter for tuberculosis, an action that must cause the suppliers—who are largely dairymen—to exercise greater care in the breeding and rearing of pigs. If this practice were more generally adopted, creameries would be forced to pasteurise separated milk, and the prevalence of tuberculosis in pigs and calves would undoubtedly be perceptibly diminished within a comparatively short period.

The compulsory application of the tuberculin test for the eradication of bovine tuberculosis in this State has from time to time been advocated by persons possessing abundance of enthusiasm, but lacking intimate knowledge of so gigantic an undertaking. In addition to the limitations to the use of tuberculin, which have previously been referred to, there are the limitations of human fallibility to be contended with, a fact which only those responsible for the administration of large Departments may fully appreciate. Further, most of the difficulties experienced by other countries in their attempts to eradicate the disease by the tuberculin test assume still more serious proportions in this State, owing to the methods of animal husbandry in vogue, the extensive trafficking in stock, the vast area of territory involved, and its relatively sparse population. Moreover, the restriction on the movement of cattle would be most harassing to many industries, the cost to the State enormous, and the probability of success remote.

Even if operations were confined to dairy cattle alone, and an annual appropriation of £50,000 were made for the employment of a large staff of inspectors and lay assistants, compensation to owners, administrative expenses, &c., it is estimated that eight years would be occupied in testing but once all dairy cattle in the State. To be of material service the appropriation would need to be permanent, and one might well be pardoned for doubting whether the benefits to be derived at the end of (say) ten years would justify the expenditure of half-a-million of public money upon economic grounds alone. From a public health point of view, it might be argued that no cost is too great to rid the State of so dangerous a source of tuberculosis in man, but even if this aspect alone be considered, the advisability of commencing with a moderate scheme is manifest. An annual appropriation of £10,000, expended judiciously in repressing the disease in herds supplying milk to the more populous centres of the State, would undoubtedly be beneficial to the dairymen concerned and their customers, but the actual progress towards the general repression of the disease attending such a scheme would not be great. Under existing conditions it is quite possible for each dairyman to do much by his own efforts towards the elimination of tuberculosis from his herd, and State direction and assistance in this connection appear to offer the most economic and soundest policy to adopt at the present juncture.

Of recent years a considerable amount of research and experimentation has been carried out with respect to vaccination and immunisation of cattle against tuberculosis. Already there are several methods attracting attention.

At a recent meeting of the Academie des Sciences, Director Arloing communicated the results he has obtained in a series of experiments carried out since 1902. The vaccine matters he used were fixed varieties of human and bovine bacilli of bovine origin, deeply modified in their tuberculigenous potency by a long series of cultures in the depth of glycerinated bouillon. The modifications that they have sustained are now fixed, so that they form breeds which are indefinitely transmissible, and which, being harmless to monkeys, are believed to be also harmless to man. Arloing regards them as resembling the virulent vaccines of Kleinmer, and is positive they cannot cause any fatal infection in animals, contrarily to the "Bovo-vaccine" of Von Behring or the "Tauruman" of Koch-Shutz, to which he reproaches fatalities between 7 and 8 per cent. of the vaccinated. The vaccines he experimented with are used either by intravenous injection, or by the digestive tract, or again under the skin, and do not give rise to any appreciable lesions. Of 60 vaccinated animals and 30 untreated animals inoculated with very virulent bovine bacilli, the following result was obtained :—Among the vaccinated 50 per cent. of complete success, 25 per cent. of relative success, and 25 per cent. of failures; while among the untreated, 63·6 showed complete infection, 27·2 partial infection, and 9·2 no infection. It was noted that the disease appeared six times more important in the untreated than in the vaccinated animals. Vaccination by intravenous injection gave successful results in 73 per cent. of the cases so treated, by ingestion 50 per cent., and by the subcutaneous method 10 per cent. of perfect and 73 per cent. of partial successes. It is considered the immunity may be lost in between fifteen and twenty-two months, but may be increased for a longer period of time by subsequent subcutaneous inoculation without risk. Whilst not claiming finality has been reached, and admitting this anti-tuberculous vaccination probably still requires some improvement, Arloing considers the results so far obtained justify its use, with, however, the application of the ordinary measures of prophylaxy.

Ebeling reports having vaccinated with Behring's "Bovo-vaccine," 4,621 calves of thirty-seven different herds during the period from March, 1903, to March, 1908, with the following results :—With the exception of three that died soon after vaccination with acute lung œdema, the calves stood the vaccination well and developed into fine animals. Of 61 of the vaccinated animals from a badly infected herd, 58 proved free from tuberculosis upon slaughter at subsequent dates.

Professor Vallée has also carried out valuable research in this connection during the past six years, and has published a resumé of experimentation upon 666 animals. To confer immunity, Vallée used living equine bacilli, which he asserts were innocuous to bovines. He showed that the inoculation was not dangerous, that the resorption of the introduced bacilli was relatively simple and rapid, and that they did not recuperate any virulency in the inoculated organisms. Vaccination was always made by the various processes in two seatings, three months apart, the second dose being much the greater, varying from 20 to 40 milligrammes. Vallée found the resistance granted by the intravenous method of vaccination was proportional with the quantity of bacilli inoculated, and in no case did it permit an animal to withstand exposure to natural infection longer than a few months. It did not reduce the aptitude of bovines to be infected experimentally by ingestion. The results of subcutaneous vaccination were still less satisfactory.

During 1907 the Argentine Government caused the curative treatment of tuberculosis in cattle by Professor Von Behring's "Tulaselaktin" to be officially tested, and from the report presented by the Commission to the Minister of Agriculture, it is gathered that the treatment was not regarded with satisfaction. The conclusions the Commission arrived at were, briefly: Tulaselaktin had no prejudical effect upon the experimental cattle; it did not cause the recovery from, or the retrogression of, tuberculous lesions in the test cases, nor did it hinder the development of fresh tuberculous lesions in some of the experimental animals.

It would, therefore, appear that, while the work now being carried out offers but little hope of the discovery of a specific curative agent for bovine tuberculosis, it indicates the possibility of immunisation by vaccination, when perfected, becoming a practical method of repressing this disease, and it would appear advisable to defer the consideration of any drastic State measure until further research and experimentation have been carried out. In the meantime, and in fact at all times, it behoves the breeder, upon whom the responsibility of repressing the disease largely rests, to breed stock of sound constitution, and to rear them under conditions which preclude risk of infection.

It is of primary importance to recognise that there can be no tuberculosis in the absence of the tubercle bacillus As with a crop of corn, the seed must first be sown, and subsequent growth is dependent upon the suitableness of the soil and existence of favourable conditions. Robust constitution and good health guard against infection, while good sanitary conditions hinder the propagation of disease. Unfortunately, the contributing influences for the dissemination and growth of tubercle bacilli are many and varied. Special attention is, however, directed to the more important of the practices and influences that prevail, and whose elimination would have a definite effect in materially aiding in the repression of tuberculosis of bovines.

Inbreeding and breeding from immature animals cannot be too strongly deprecated. In-breeding is often practised to perpetuate some important quality in which certain families excel, but this is frequently acquired at the expense of the constitution—the progeny being delicate and prone to infection. The early mating of animals tends to undermine their vitality by overtaxing their system to meet the demands of rapid growth, of nourishment for the fœtus, and of provision for yield of milk. As the vital forces are lowered, both mother and offspring develop a corresponding receptivity to disease. Breeders should not lose sight of the fact that it is just as essential to preserve the points that indicate robustness of constitution as those peculiar to the breed. Efforts to improve the milking quality of any strain are defeated if the constitution of the progeny is not sufficiently strong to withstand the strain of heavy milk yield for lengthy periods. The tendency on the part of some breeders of dairy stock to make large sacrifices for increase in milk yield is but a short-sighted policy, the effects of which become manifest in the physical degeneration of the herd, once the margin is exceeded. It is unwise to breed from animals belonging to tuberculous families, as the progeny may inherit a predisposition towards the disease and readily succumb on exposure to infection.

It is possible for much benefit to accrue from improvement in the method of rearing young stock in this State. On many farms the calves are reared in a most haphazard fashion, about which much of a deprecatory nature might be said. At present it is only desired to refer to those that have special bearing upon the subject-matter. The practice of feeding calves from old wooden troughs, seldom or never cleaned, upon unpasteurised separated milk of public creameries, cannot be too strongly condemned. From a breeder's point of view much is to be said in favour of every farmer running his own separator, and sanitarians are forced to lend support to the practice until better provision is generally made by public creameries for pasteurisation of the separated milk. The momentary exposure of separated milk to a temperature of about 160 degrees Fahrenheit is not pasteurisation, but merely a commercial practice to keep the milk apparently sound for a longer period. The term "pasteurisation" means an exposure for ten or fifteen minutes to a temperature of 160 degrees Fahrenheit, and this procedure is necessary to destroy tubercle bacilli contained in the milk.

Untreated, separated, mixed milk received from public creameries is one of the most prolific sources of dissemination of tuberculosis, and it is a very unwise practice to feed calves and pigs with it in the untreated condition, as the milk of one cow suffering from tuberculosis of the udder, supplied to a public creamery, may be responsible for the spread of the disease to many farms in the district. The pasteurisation of milk is undoubtedly a troublesome procedure, but the labour involved can be considerably reduced by the use of proper apparatus. Compulsory pasteurisation of separated milk prior to distribution by public creameries offers the most expeditious solution of the difficulty. With milk from a tested herd separated on the farm, no treatment is needed provided it is given to the calves within a reasonably short period. The method of feeding poddy calves as adopted at the Government Stud Farm at Berry is strongly recommended; the calves are put in separate stalls, and each is fed from its own bucket. The use of artificial teats in connection with this method has many advocates.

As many of the ailments of calves are "filth diseases," cleanliness is an essential for the rearing of robust stock. Apart from ill effects directly traceable to such ailments as "white scour" and "lung disease," the vitality of the affected animal is so depleted that it readily succumbs when exposed to infection by tubercle bacilli. The semi-starved condition which many yearling calves suffer for many months after they are weaned, from scarcity of food or the innutritious nature of their fodder, lessens their power of resistance, and has a similar effect. A liberal supply of nutritious food is essential for the maintenance of good health.

It is generally admitted that the excessive drain on the system caused by heavy milk yield is one of the chief reasons for the greater prevalence of tuberculosis among dairy cows, and as the disease is one of slow development, the advisability of keeping adult cows under close surveillance is manifest. Suspicious cows should be tested and immediately removed if they react. Occasionally one finds a farmer exercising more than ordinary care in the rearing of the calves, yet he unhesitatingly introduces into his herd cows bought at public sales, about whose previous history he has no knowledge, and, consequently, repeatedly exposes his herd to risk of infection. It has been said that the extension of tuberculosis in herds has been coincident with the development of commerce in live stock. All interested realise that the manner in which dairy cattle are usually sold at auction offers the buyer little or no protection, and even with cows from reputed clean herds, one cannot be certain as to their freedom from tuberculosis without applying the tuberculin test.

Tuberculosis is a disease of man, of cattle, of pigs, and of fowls, and it is communicable from one to the other. Consequently, a tuberculous attendant should be debarred ; pigs and fowls should be kept within enclosures, to prevent contamination of the pasturage. Of recent years veterinarians are inclined to regard infected pasturage as an important source of dissemination of the disease, and the occasional cultivation of grazing lands may be advocated for sanitary reasons as well as for agricultural purposes.

Of late years abortion in dairy cows has become more prevalent, and as a certain percentage of the cases are directly traceable to tuberculosis, the disinfection of the womb and genital passage of recently aborted animals should be systematically practised, especially as it has been proved that the discharges of a tuberculous cow are often infective.

Finally, sufficient importance is not generally attached to the use of only healthy, vigorous bulls. The application of the tuberculin test should be more commonly resorted to by farmers for their own protection with respect to their private bulls; while much is to be said in favour of the compulsory testing of public bulls. In this connection, it is possible for Agricultural Societies to considerably benefit the dairying industry by declining to award prizes to other than bulls that have successfully passed an official test with tuberculin.

Insectivorous Birds of New South Wales.

[Continued from page 142.]

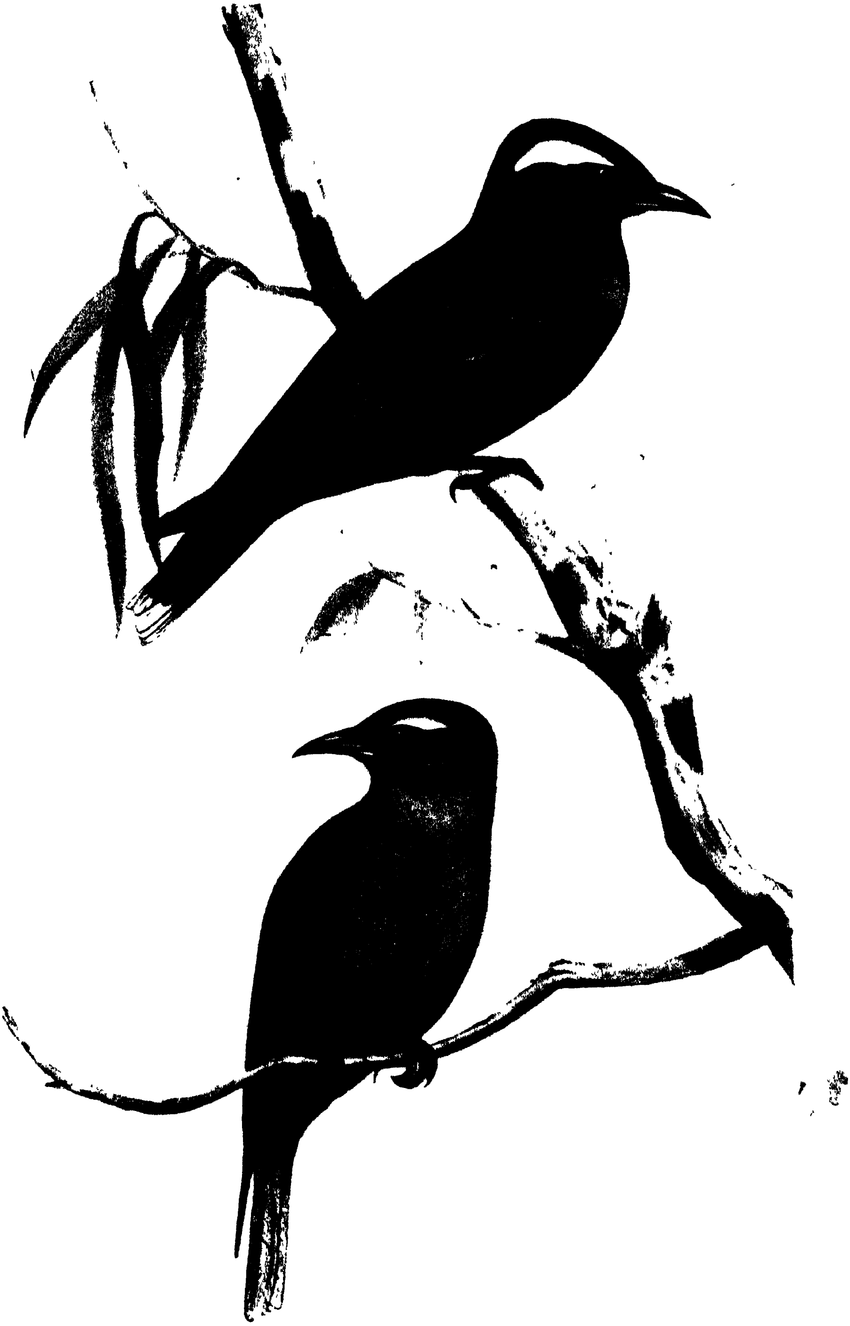
27. White-browed Wood Swallow.

We have selected this bird to illustrate the wood swallows, the genus *Artamus*, of which there are some eight or nine species. This one and the Masked Wood Swallow (*Artamus personatus*) are probably the most widespread, and are commonly found travelling and nesting in flocks together ; indeed, several instances are recorded of the two species interbreeding.

The white-browed bird is distinguished from his relatives by the broad white stripe above the eye of the male, whilst the female has a slight indication of the same peculiarity. The bird is commonly called the "Martin," or "Summer-bird," the latter name apparently in reference to the time of the year at which it is seen. It is a migratory species, visiting the southern portion of Australia only in the warm months, and passing the winter in the far interior or away in the islands to the north. It is commonly met in Riverina, but only rarely visits Adelaide and Melbourne, where its arrival is an almost certain indication of a dry, hot summer.

For the Wood Swallows are essentially dry country birds. They travel and nest in groups, and their whistling notes can often be heard when the birds are almost out of sight in the air. What interests us most, however, is their food, and all the standard works on Australian birds mention one article of diet as being prominent—the grasshopper. Such havoc does the Wood Swallow work upon the plagues of grasshoppers, just as they are issuing from their breeding-grounds, that it might reasonably be called the locust-eater. Locusts do a great deal of damage in Australia at times, but are not generally as serious a pest here as they are in some other parts of the world where rich pastures adjoin and merge into the desert. We owe a good deal of our protection to the Wood Swallows, which go out into the dry country and live upon the swarms, like so many little soldiers sent out by advancing agriculture to clear the ground of the enemy. Eventually, with the aid of our birds, we shall so reduce the pest that it shall cease to be hanging over our heads like the sword of Damocles; in the meantime we should be wise, and give encouragement and protection to the White-browed Wood Swallow. He is also very fond of caterpillars.

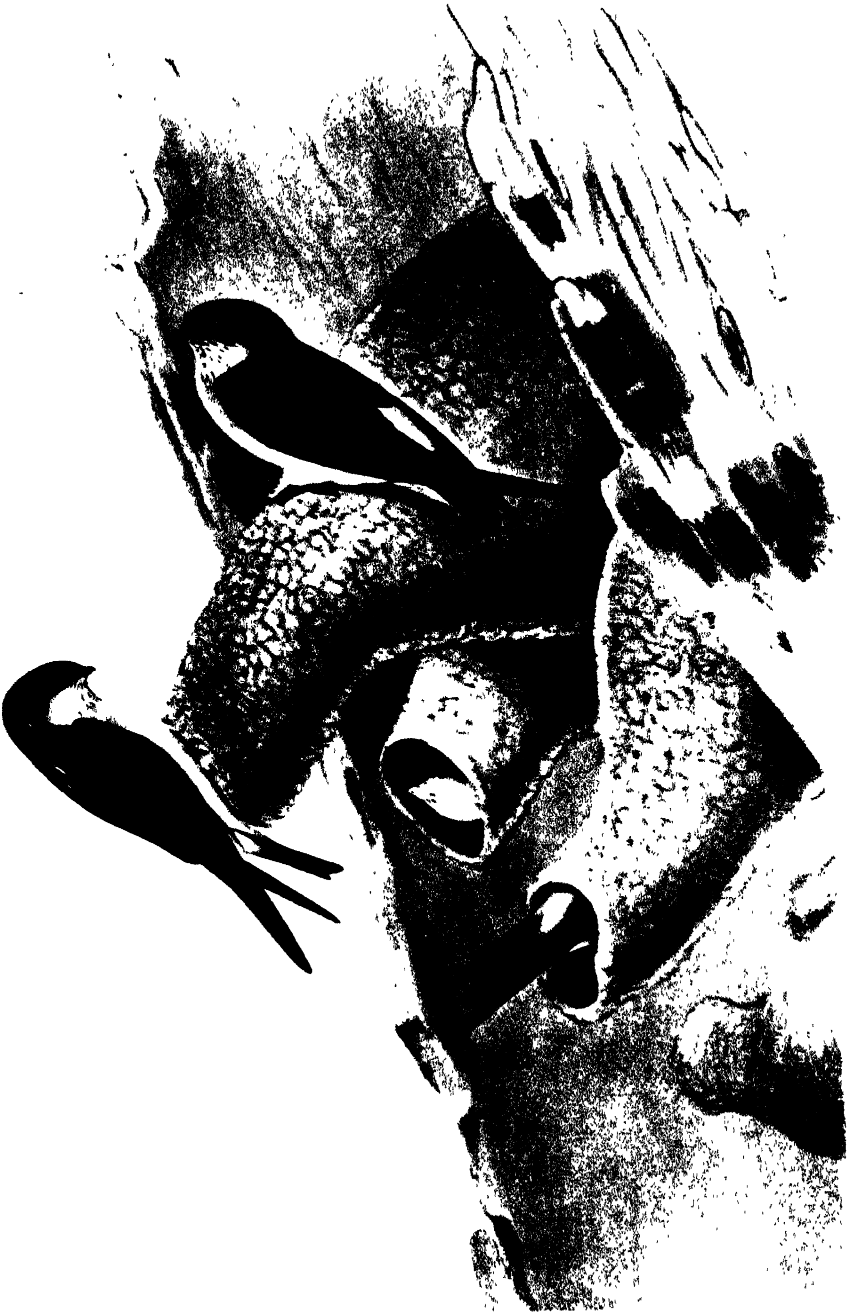
His near relative and travelling companion, the Masked Wood Swallow (*A. personatus*), has not everywhere the same claim upon our affection, because he has allowed his taste for insect food to develop into a fondness for bees. In some districts he is known as the Bee-Martin. Although he destroys a number of injurious insects, such as the pear-slug, he is generally regarded in bee-keeping districts as working more damage to apiaries than can be compensated by his useful activities amongst our pests.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"WHITE-BROWED WOOD SWALLOW."

Artamus superciliosus, Gould.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"FAIRY MARTIN."

Petrochelidon ariel, Gould.

28. Fairy Martin.

Sometimes under a bridge, but more usually upon the steep face of an alluvial river-bank, the curious nests of these little creatures may be found in clusters. They are built of mud, and lined with grass and feathers; and their shape resembles a distillery retort, so that the birds are often called "Bottle-nest Swallows." Fifty or more nests will be built together, and the result is a peculiar collection of hollow bottle-like projections from the bank. They also nest under the eaves and verandahs of buildings. Co-operation in nest-building is the rule, a large number of birds working together on each nest. If a nest should be damaged in any way, all hands will help in the repairs, which will be carried to completion in a very few minutes.

The Fairy Martin also is a migratory bird, passing the winter in the far north; but in many parts of the State some remain throughout the year, and if the winter is mild, the flocks return very early in the spring. They usually nest in the same place each year, repairing and extending the collection of little homes. The number of eggs to a sitting varies from three to five.

These fairy-like birds are purely insectivorous, catching their prey on the wing. But they have a number of enemies themselves in the feathered world, prominent amongst these being that good insect-eater, the Red-backed Kingfisher. The kingfisher will gradually peck away the mud entrance to the nest, and then drag forth and devour the eggs and young. So here we have a kind of perpetual civil war between the little soldiers who are fighting the farmer's battles along our rivers and creeks. Sparrows will also occasionally take possession of the Martin's nest.

Closely related to this bird is the Tree Martin (*Petrochelidon nigricans*), which usually nests in hollow trees—a situation rarely chosen by the Fairy Martin. There is very little difference between the two species, except that the reddish colour on the forehead of the one is carried over the crown of the other. Regarding their value as insect-eaters, Mr. Hall says:—

> While the Fairy Martin feeds in a lower stratum, upon the rivers, and the Swifts in a high stratum of air, the Tree Martin, in common with the House Swallow, works the intermediate one. That is to say, different kinds of insects, which live in different strata of air, have different kinds of swallows to keep them in subjection. There is also a black and white swallow (*Cheramœca*) that keeps to the dry interior, doing good duty by maintaining a balance in these parts.

We hope these notes will enable readers to see the whole family of swallows and martins in their true colours; and we now pass on to other species of these useful insectivorous birds.

Herd-testing Associations.

A PROMISING START AT DENMAN.

THE Denman District Herd-testing Association has commenced operations, and promises to be a very successful organisation. It is controlled by a Committee of Management, consisting of President, Mr. E. R. White; Vice-Presidents, Messrs. F. J. Lynch and M. H. Blake; Hon. Treasurer, Mr. F. M. Bell; Hon. Secretary, Mr. C. M. Mills; and Members of Committee, Messrs. D. M. Bell, N. Willis, J. T. Redman, C. Grace, E. Oxford, and F. J. Hewitt. The rules provide that a subscription of 1s. 6d. per annum per cow listed shall constitute membership; that the maximum charge shall not exceed 2s. per cow; and that the financial year shall end on 30th September in each year. All the members of the committee, except the Hon. Secretary, must be contributing members, and one-third of their number must retire each year. The annual meeting is held in October.

The Association has appointed Mr. E. M. Williams, a certificated ex-student of the Hawkesbury Agricultural College, as Tester. The milk of each cow in the official test milkings is weighed night and morning, and a composite sample is taken and tested as nearly as possible during one or more days in each month. Each contributing member receives a copy of the weight, fat test, and computed amount of commercial butter of the milk of his cows as soon as possible. Each cow is marked for identification. The committee may give an award or certificate to a member listing a cow whose milk exceeds 6,500 lb. in weight or whose butter-fat exceeds 270 lb. commercial butter in a milking period.

On 12th January, 1912, the number of members was 15, the amount subscribed, £180 7s. 6d., and the number of cows to be tested, 2,405. Other dairymen are joining, and it is expected that two testers will be required. The Minister has approved of the Association being registered for subsidy, so that it will receive from the Government a subsidy of 10s. in the £ on subscriptions.

Mr. Williams commenced by testing a small dairy herd close to head-quarters; then he went to one of 85 milking cows; then to one of 125 cows. The four or five herds now being tested include from 100 to 110 cows each.

It will thus be seen that the Denman Association is a most promising one; and it has been formed in a comparatively dry district. It is hoped that the example afforded will stimulate farmers in other dairying districts to form such associations for their mutual benefit.

WHITE ANTS ATTACKING AUSTRALIAN RAILWAY SLEEPERS IN INDIA.

DURING last year a Committee appointed by the Indian Railway Board made an exhaustive inspection of Australian sleepers on Indian railways, particularly the southern section of the North-Western railway, whence reports had been received of serious damage by white ants. They also obtained reports from the various Railway Administrations throughout India, as to the extent of damage suffered from white ants attacking Australian sleepers.

The Committee found that it was only in one section of the North-Western railway that the attacks were really serious. This section is an almost rainless belt of sandy desert. In all other parts of India, all Australian timbers used were found liable to attack by white ants, but the damage was not in any case serious, even after the sleepers had lain for six or seven years in the road.

There is considerable uncertainty as to the exact species of timber used for many of the sleepers, but the Committee satisfied themselves that the sleepers examined and reported upon were Australian wood. They also found no difficulty in distinguishing Jarrah and Karri from the timbers of Queensland, New South Wales, and Tasmania.

On the North-Western railway, none of the Australian sleepers were immune from white ant attack, but white ants prefer Jarrah sleepers to other species of Australian woods, with the possible exceptions of Tasmanian Stringybark and Blue Gum, and New South Wales Turpentine. With regard to New South Wales timbers, Grey Gum appears to withstand the attacks best, but very few sleepers of this timber was seen. Blackbutt appears very liable to split, thus affording easy access to the white ants. The timbers mentioned were amongst those which the Committee were able to identify from the Government brands stamped on the ends of the sleepers.

Tasmanian sleepers are definitely pronounced as unsuitable to India, either for dry or wet zones, as they appear very liable to rot and split in addition to being liable to the attack of white ants.

Creosoted pine sleepers, even in the badly affected districts, showed practically no trace of white ants. Deodar sleepers were attacked in comparatively few cases, and then always in the sapwood. White ants seem only to attack them when very old.

Government Bureau of Microbiology.

93, Macquarie-street, Sydney.

DIRECTIONS FOR FORWARDING SPECIMENS FROM DISEASED ANIMALS.

IT will greatly facilitate the work of examination if specimens upon which opinion is desired are forwarded in accordance with the following methods:—

1. Whenever possible, make smear preparations; pus and other fluid discharges should be thinly smeared on a small thin piece of clear glass. The proper microscopic glass slide is to be preferred; but failing this, a piece of glass not exceeding 3 inches long and 1 inch in breadth may be used. When the disease is in the solid tissue, the cut surface of this should be pressed or lightly streaked on the glass. The smear, whether from liquid or solid, must be thin; it is almost impossible to make it too thin. The smear is to be made on one side of the glass, which may then be set aside or waved in the hand till it is dry, a matter of a minute or two. Do not expose the slide to the sun or to heat. When dry, the slide may be wrapped in clean paper and protected against breakage during transport by packing in cotton wool or other soft wrapping, and enclosing in a box or stiff covering.
2. If large quantities of fluid are to be forwarded, they should be collected in bottles which have been previously boiled. The corks should be boiled as well as the bottles.
3. Solid tissues to be examined for tumours or other structural changes may be placed in formalin or in methylated spirit. Formalin is to be preferred, and when available, should be used in the proportion of one part of commercial formalin to ten parts of water. Methylated spirit is to be used pure. In either case, use plenty of the preserving fluid; there should be much more fluid than tissue.
4. Solid tissues to be examined for micro-organisms must not be placed in the above preserving fluids, which would kill the germs. Whenever possible, such specimens should be sent in the fresh state, and without any addition whatever. When the time required for transport is likely, however, to exceed twenty-four hours, putrefactive changes are apt to occur and cause trouble, not only during transport, but as regards satisfactory examination on receipt. In these cases a satisfactory result may still be obtained if the tissues are packed in salt—ordinary powdered salt well dusted over them—and then packed in a box or jar with plenty of salt surrounding them.

5. Where the consignor possesses the knowledge necessary to their use, sterilised receptacles, phials, pipettes, or culture tubes will be supplied on application to the Bureau.

Persons proposing to make use of the Bureau in any particular direction should communicate with the Director, specifying particulars of the case they wish examined. Any advice possible will be given as to the best modes of transmission.

N.B.—In all cases it is desirable to send smear preparations as well as the solid tissues.

THE MACMEIKAN PROCESS OF DEFROSTING BEEF AND MUTTON.

THE Agent-General in London has forwarded a report by Mr. Lionel Hurley, of his staff, who attended a demonstration by the Macmeikan Defrosting Process Company, Limited, at Plymouth, on 8th November, 1911. The process is one by which frozen meat is thawed in a chamber so constructed that the atmospheric pressure can be regulated and excess moisture extracted without bursting the tissues of the meat. It is claimed that frozen beef and mutton can then be placed on the market in such a condition as to compare favourably in appearance with prime English meat.

This demonstration was attended by representatives of the meat trade of Australia, Great Britain, the United States, and South America. The beef and mutton had been taken from ss. "Osterley," and held in a temperature of 18 degrees for about three weeks. It was then placed in the patent chambers, beef for forty-eight hours and mutton for twenty-four hours, in a temperature of 62 degrees. Upon removal from the chambers the meat was compared with prime English beef and a frozen quarter from Queensland treated under the old system. It compared favourably with the English meat, and was far superior to the Queensland. It had a fine bloom, and was free from mould, whilst there was an entire absence of "leakage." The kidneys and suet fat remained in the treated quarters, and when cut were fresh and free from bone-taint or bone-stink. Quarters of treated beef and carcases of mutton were cut up in the presence of the visitors with satisfactory results, defrosting having been thoroughly carried out. On the following morning Mr. Hurley inspected the treated meat, cut and uncut, at Smithfield Market, and found it still satisfactory and free from the drawbacks of frozen beef marketed in the usual way.

It is stated that the Company intend to erect works at Melbourne, and later to extend operations to Sydney, and that during this year beef and mutton frozen and defrosted by the process will be placed on the English markets in bulk.

Rotation of Crops in Texas.

In March, 1911, *Gazette*, page 199, we attempted to compare the conditions existing in the dry-farming areas of the United States with those of the drier parts of New South Wales, and we pointed out the apparent similarity between the central western portion of Texas and our own northern wheat-belt. Both regions have annual rainfalls of 20 to 30 inches, and elevation of about 1,000 feet; they are about the same distance from the Equator, and have similar ranges of temperature. In both regions the greater part of the rain is received in summer, and both are subject to irregular periods of drought.

In Texas they have a black soil problem. A belt of black soil runs obliquely through wet and dry areas alike. It overlies limestone. Some of it is loamy, some stiff black clay. Chemically it is an excellent soil in its virgin state.

In the early part of the nineteenth century this black soil patch was used chiefly for hunting. Later on it was devoted to grazing, but when railroads and barbed wire came along farming was introduced. Cotton has been the chief money crop since the sixties. Root-rot has lately made it necessary to rotate crops, and corn, sorghum, wheat, rye, and oats are grown to a great extent. Legumes, such as lucerne and cowpeas, have been used a good deal, but root-rot attacks the lucerne too, and the cowpeas have not proved very successful.

The United States Department of Agriculture has devoted some attention to this area, and has issued Circular No. 84 of the Bureau of Plant Industry —"Suggested Cropping Systems for the Black Lands of Texas," by B. Youngblood, Assistant Agriculturist, Office of Farm Management.

The author, commenting on the fact that the agriculture of the region has developed largely without legumes, quotes the case of Mr. James Burns, of San Saba, Texas. Thirty-two years ago Mr. Burns divided 90 acres of his 160-acre farm of black lands into three equal fields, and has practised a three-year mixed rotation ever since. His crops are—(*a*) wheat and oats; (*b*) cotton; (*c*) corn, milo, and sorghum. On this farm are kept thirty to forty head of high-grade Shorthorn cattle, ten to fifteen Duroc-Jersey hogs, and 100 to 200 chickens. As soon as the crops are harvested the stock are turned in to glean the fields. The wheat and oats are grazed until about 1st March (corresponding to 1st September here), when the stock are taken off and the grain allowed to mature. In this manner everything produced is saved, and sufficient manure has been added to the soil to maintain its fertility. Mr. Burns breaks his ground as early as practicable in fall and winter, and keeps it stirred until planting time with the disc and a steel-toothed harrow. All crops except wheat and oats are planted in rows, and at rates of seeding which give stands about three-fourths as thick as is customary in a humid climate. Shallow cultivation (2 to 4 inches) is given as often as is necessary to maintain a mulch and keep down grass and weeds throughout the growing period of the crops. He has lost nothing from root-rot. His average rainfall from 1901 to 1910 was 24·6 inches. In spite of droughts, he has met all obligations, and has reared and educated a family of eighteen children from his 160 acres.

Mr. Youngblood has convinced this farmer that he is wrong in not including legumes in his rotation. In his early experience he was unsuccessful in getting suitable varieties, so he managed very successfully without them, the manure from his stock keeping up the fertility of the farm. Now he has tested a number of newer varieties under the Department's direction, and has found some worthy of inclusion, so that for the future his farm will be worked on a four years' rotation, the sections being now 22½ acres instead of 30. It is expected that he will now produce his money crops—wheat and cotton—on a smaller area, whilst the increased productiveness of the soil which is expected to follow will enable him to keep a larger number of live stock. His rotation will now be—(*a*) wheat and oats; (*b*) legumes; (*c*) corn, milo. and sorghum; (*d*) cotton.

Another point of interest noted in the area dealt with in this Circular was the fact that, owing to root-rot, farmers were obliged to plough up their lucerne paddocks after two, three, or four years, and plant corn, cotton, wheat, or oats. When they have done this, they have received increased yields varying from 50 to more than 200 per cent. Mr. Youngblood urges them to make this a regular practice. He quotes the example of William Munford, a man farming similar black soil in Alabama. Mr. Munford had land which had not produced more than 18 bushels of corn. He planted lucerne on it, and ploughed up a portion after two years and sowed corn again. The result was 45 bushels per acre. Another portion was left three years in lucerne and then ploughed up and sown with corn. This gave 55 bushels per acre.

Mr. Youngblood recommends that a farm of 160 acres should include 10 acres as farmstead block, 30 acres of permanent pasture, and the balance, 120 acres, should be divided into four paddocks for a four-course rotation—(*a*) lucerne; (*b*) corn; (*c*) cotton or wheat; (*d*) oats. The lucerne remains for three years; the other crops are changed about on the three blocks each year; then the lucerne goes to block 2, whilst blocks 1, 3, and 4, are cropped with corn, cotton or wheat, and oats alternately. It takes twelve years to complete the rotation.

We do not grow cotton in the north-west, but the other crops are standard ones there, as they are in Texas.

Another pamphlet recently to hand bears out Mr. Youngblood's argument in favour of a legume in the rotation. This is Bulletin No. 294, of the Cornell University College of Agriculture, New York—"A Heretofore Unnoted Benefit from the Growth of Legumes." It has long been known that legumes store nitrogen in the soil, and that this nitrogen helps the succeeding crop, whilst the ploughing-in of crop residues and roots after feeding-off increases the humus content of the soil. But in the drier parts of New South Wales, crops do not seem to require as much nitrogen as in other parts of the world. It has been a disputed point whether there is any advantage in growing a legume in preference to any other good feeding crop, the residues of which, when ploughed in with the manure, supply humus and maintain fertility. Farmers in New South Wales have got results like those of Mr. Burns without legumes.

Now protein, the ingredient which gives a food its power to produce animal growth as distinct from fatness, is largely nitrogen; and if there is an abundance of nitrogen in an available form stored in the soil, other plants growing upon that soil might be expected to contain more protein than those growing upon a soil with a less supply of available nitrogen. The Cornell experiments show that this is the case. Timothy grass grown with lucerne was found to yield hay with considerably more protein than when no lucerne was present. Similar results were obtained when red clover was used instead of lucerne. Oats benefited by being grown with peas. It was also found that the nitrifying power of a soil which had grown lucerne for five years, and was then kept bare of vegetation for a summer, was greater than that of an adjacent plot which had grown Timothy for the same length of time, and which was likewise kept bare for a summer. The inference is that if you use a legume in your rotation in preference to a feeding non-legume, the succeeding crop certainly gives as great a yield per acre, *and the produce has a higher feeding value.*

THE PLACE OF WHEAT.

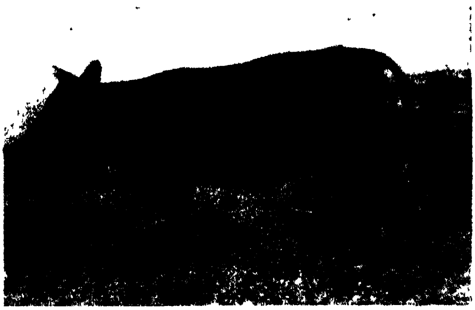
THE man in the street naturally seeks some explanation for the extraordinary popularity of this cereal, and under the existing economic conditions convincing reasons are readily forthcoming. Wheat is an excellent pioneer crop, and it lends itself admirably to the *extensive* system of farming common to all comparatively new countries, where, compared with densely-populated countries, land is cheap, and individual holdings considerable, high class farming is rarely practised, and the object of the cultivator is rather to secure a small average return from an extensive acreage than a large average return from a small area. With our multiple-furrow ploughs, 20-tine cultivators, and 4-horse drills, large areas can be cultivated with the minimum of hand labour, and the complete harvesters enable the grain to be taken off with the greatest facility. With the increase of population, and the inevitable increase in land values ahead of us, this system of farming, particularly in Victoria, will gradually be modified, and a new era will be ushered in, characterised by smaller areas under individual cultivation and higher averages per acre.—A. E. V. RICHARDSON, in *Journal of Agriculture, Victoria.*

Examples of Profitable Dairying.

P. G. HAMPSHIRE, Dairy Instructor.

As showing the results of careful selection and breeding of dairy cattle, together with systematic culling and attention, a number of dairymen on the Hastings River are good examples of the splendid incomes to be derived from the dairy cow.

Mr. W. J. Andrews, of Wauchope, is deserving of special mention. His returns for October last are remarkable. Mr. Andrews has a farm of 70 acres of good alluvial land, which he devotes entirely to dairying. There is an excellent growth of mixed grasses in his pastures, principally Paspalum, couch, and clover. The farm is subdivided, and the owner observes the sound policy of frequent changes from paddock to paddock, thus always having a fresh shoot for the cows to depasture when changed.



Grade Jersey Cow.
Property of Mr. W. J. Andrews, Wauchope.

Mr. Andrews milked 37 cows (11 being heifers on first calf) for the month of October, and they produced 1,339 lb. of butter, which brought him in £62 15s. 4d. This is equal to an average of 33s. 10d. or 36 lb. of butter per cow for the month. The herd averaged 95 gallons of milk per day, testing 4·2 per cent. butter fat.

For the first week in November the herd returned an average of 8¼ lb. of butter per cow. The returns for the full month of November were £51 16s. 10d. He milked 39 cows up to 16th November, and 27 cows afterwards.

This herd is comprised mostly of large-framed, roomy, grade Jerseys, some being three-fourths and some seven-eighths Jersey. Mr. Andrews has now a well bred Jersey bull by the Government bull, "Sir Jack," who is a fine type of a Jersey. Mr. Andrews is a great believer in culling cows by testing them, and he largely attributes his success to this true and systematic method of finding out a cow's true worth. The average of this herd for twelve months was over £10 per cow.

Another good farmer is Mr. Duncan Graham, of Koree Island. From 42 cows Mr. Graham obtained 1,284 lb. of butter for October, equal to £60 3s. 9d., an average of 28s. 8d., or 30·57 lb. of butter per cow for the month. In November, 44 cows produced £59 8s. 4d. The year's return from this herd, milking up to 52 cows, was 11,979 lb. of butter.

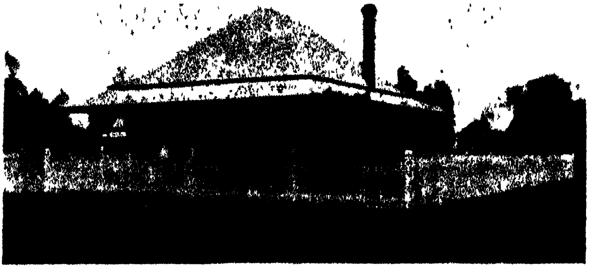
Mr. Graham, by careful selection of bulls and constant culling of cows, has a very fine herd of milking Shorthorns, typical of the famous Illawarras. The owner is now using a fine type of well bred Ayrshire bull (a grandson of Jamie of Oakbank); but he intends to secure a Guernsey bull shortly.

A well-bred Milking Shorthorn—a successful Butter cow.
Property of Mr. D Graham Keree Island.

Grade Durham Cow—a good milker.
Property of Mr. D. Graham, Keree Island.

Other good returns for October are those of Mr. Jacob Healy, of Port Macquarie, who, from approximately 100 cows, received £122; Mr. P. H. Seccombe, of Gowrie, did well with £54 from 45 cows; and there are numerous other farmers who are receiving over £1 per cow per month.

All the farmers mentioned are keen breeders, who have recognised the great value of culling and selection of a pure dairy sire.



Mr. D. Graham's Homestead, Keree Island.

Fruit for Export.

NEW COMMERCE ACT REGULATIONS.

THE following regulations have been made under the Commerce Act :—

The words "sound" and "soundness" are not in future needed on cases.

Trade Description (Present Requirement).

The words, "New South Wales, Australia," and either the name of the exporter or producer, or his registered brand, the net weight or quantity, and the name of the fruit.

Additional Future Requirement.

In the case of fruit of various sizes the trade description shall include the word "unsorted."

Apples under 2¼ inches in diameter shall include in bold and legible characters the words "under 2¼ inches."

In the case of fruits which are unsound, or are of inferior quality, the trade description shall include the words "second grade."

Condition of goods below standard or inferior must be stated on "notice of intention to export."

If fruit is affected by a disease, the notice of intention to export must show to what extent it is so affected, and in the case of apples, if under 2¼ inches in diameter, such to be stated.

Specimen of Branding.

The following specimen meets the requirements of the new regulations, and should appear on the end of the case :—

APPLES

Grown by

JOHN JONES,

Gilgunnia,

New South Wales, Australia.

Rome Beauty. *Extra Choice.*

ONE IMPERIAL BUSHEL.

Experience of Vignerons with Phylloxera-resistant Stocks in the County of Cumberland.

M. BLUNNO, Viticultural Expert.

AT the beginning of September last year, reports appeared in the Sydney newspapers to the effect that thousands of grape-vines in the County of Cumberland were either dead or dying, especially in the vicinity of Fairfield, Smithfield, Cabramatta, and Canley Vale. Vignerons were stated to have received a "rude awakening," when they started pruning, to find that hundreds of vines in their vineyards had died since last season. The variety which suffered most was the Late Sherry, grafted on phylloxera-resistant stock. Several theories were put forward to account for this unfortunate occurrence. One vigneron blamed the excessively wet summer, coming at a time when the vines were carrying heavy crops, and inducing a heavy growth which exhausted the vines. Another considered that the graft had proved too vigorous for the stock under these moist conditions.

On 4th September I visited the district and inspected seven vineyards around Fairfield. On *primâ facie* evidence the alarm was found to be justified, vines of the variety Doradillo, or Late Sherry, being apparently dead in great numbers; but Black Hamburg, Black Muscat Hamburg, Early Sherry, and a score of other varieties less extensively grown, were not in any way affected, and were healthy and strong. But the vignerons certainly did not blame the phylloxera-resistant stocks for the loss of the vines.

I have since visited a large number of vineyards in the County of Cumberland, partly to ascertain, if possible, the cause or causes of the failure of the Late Sherry vines, and partly to observe the success or failure which has attended the action of those vignerons who have, upon the advice of this Department, reconstructed their vineyards upon phylloxera-resistant stocks. Some extracts from my notes are given for the information of the public. Summarising them, it may be said that vignerons do not blame the phylloxera-resistant stocks for the failure of the Doradillos; and that an overwhelming majority of the vignerons who have planted the stocks are satisfied that the Department acted in their interests in advising that the stocks be used, and many have given their actual returns, showing that the adoption of this method has prevented phylloxera from becoming anything in the nature of a national scourge in the State. It would not be fair to publish the names of the vignerons who have thus supplied me with particulars of their private business; consequently, the locality alone can be given.

The Failure of the Doradillos.

The blaming of the phylloxera-resistant stocks for the failure of so many Late Sherry, or Doradillo vines, was a clear case of considering as a cause what was really only a collateral circumstance. The majority of the Doradillos having been grafted on phylloxera-resistant stocks, it was perhaps natural that some should connect this circumstance with their death. But those expressing such an opinion in the newspapers overlooked the fact that Doradillos *growing on their own roots* also perished.

But very few vignerons seriously considered the stocks as the likely cause of the trouble. One gentleman at Fairfield, who lost the same percentage of Doradillos among the grafted as among the ungrafted vines, has since grafted Doradillos on resistant stocks. This vineyard, however, only suffered the loss of a few Doradillo vines here and there. Another vigneron at Wetherill Park has a block of 2,000 grafted Doradillo vines, and suffered no loss whatever. Several other vineyards visited had sustained no loss. The heaviest sufferer that I met was a gentleman at Smithfield, who has a vineyard of 5 acres entirely reconstructed on phylloxera-resistant stocks. The varieties Black Hamburg, Black Muscat Hamburg, Gordo Blanco, Early Sherry, Gros Colman, and Centennial, were all doing well, but he lost 300 Doradillos out of 2,000. But to show the value of the stocks, one gentleman informed me that he got from 6 to 7 tons of Black Muscat Hamburg grapes from an acre of grafted vines. At 2d. per lb., this is a gross return of a good deal more than £100 per acre.

A "pleasant awakening" was, however, in store for many of the disappointed vignerons. On 13th October I visited a number of vineyards and found that most of the Doradillo vines which had been given up for dead, had all shot again, though they were a little behind the others. These resurrected vines all carried normal crops. One gentleman had 4,000 Late Sherry vines grafted on Riparia Gloire de Montpellier and Riparia Grand Glabre. Although he first thought that his loss was large, at the date of my visit only 150 had not sprouted. In another case, where the grower thought 3,000 Late Sherry vines were all dead, only between 150 and 200 had failed to sprout. One large grower lost no vines of any kind through the wet season, but he lost about 400 young fruit-trees. He had a large number of Late Sherry, but not one single vine was affected.

Even of those vines still not sprouting, in many cases the roots and stem up to 2 or 3 inches above the ground were quite alive.

Only one vigneron of the seventy-five visited up to this date blamed the phylloxera-resistant stocks. This grower had Late Sherry vines both grafted and on their own roots, and all were affected alike; but he was very strongly biassed against the stocks.

The prevalent opinion among the growers appeared to be that the Late Sherry is an extremely heavy bearer, especially when grafted on phylloxera-resistant stocks. One grower picked 54 grape cases from 52 such vines, which means about 25 lb. of fruit per vine. As the vines in the County of

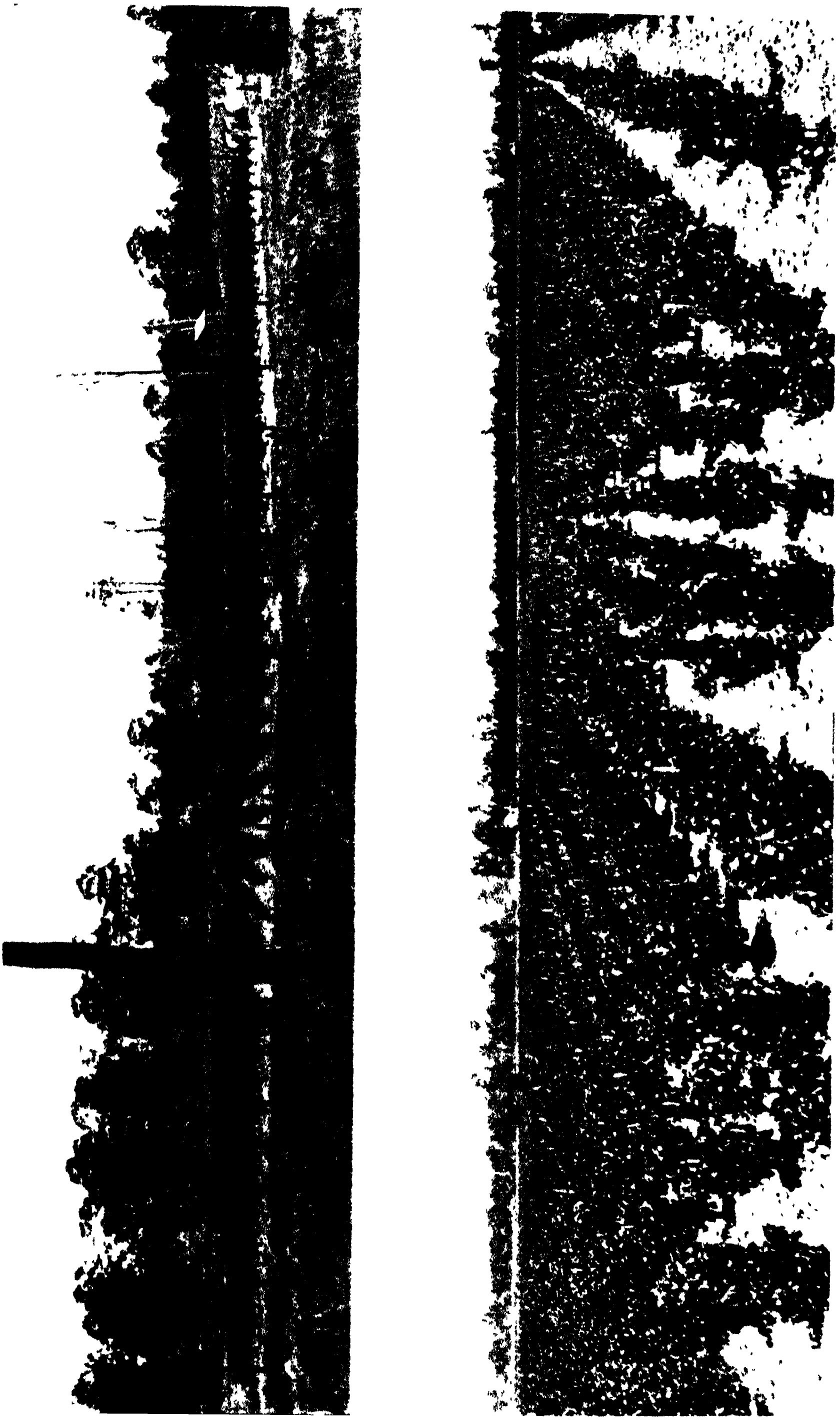
Cumberland are generally planted 5 feet x 5 feet, or at most 6 feet x 6 feet, this means from 13 to 19 tons of grapes per acre. Vignerons blamed themselves for the little trouble experienced, saying they had been "too greedy."

In subsequent visits to other vineyards in this district, it was evident that a contributing cause to the death of Late Sherry vines was faulty grafting. One grower at St. John's Park had several times complained of vines grafted on phylloxera-resistant stocks taking "the rust"—*i.e.*, the leaves, as the season advances, get pinched, and the margins curl and dry up. I had informed him that this was a sure sign of a faulty graft. On the occasion of this visit, I invited him to pull out any three vines he chose; and by sawing across the grafts I proved my assertion to his satisfaction. Another grower at Cabramatta showed me some vines, principally Late Sherry, that had died. Having pulled up two of them, I convinced him that the grafts were defective.

Another proof, if such can possibly be needed, that the phylloxera-resistant stocks have not caused the loss of Late Sherry vines, is afforded by the experience of a vigneron at Landsdown. This gentleman lost 40 Late Sherry vines out of about 3,000. These vines were partly not grafted at all, partly grafted on phylloxera-resistant stocks, and partly grafted on Black Hamburg. All three classes were represented among the 40 dead vines.

Two vignerons at Landsdown informed me that their Late Sherry vines lost all their leaves during the continuous rains last summer, and this year the vegetation of these vines is rather poor compared with that of other vines which did not lose their leaves. One of these growers has all his Late Sherries on their own roots, but still some have died, whilst all are looking poorly.

There seems little doubt that the heavy rains last summer (27 inches in some places) must be held responsible for the loss of the few Late Sherry vines which occurred here and there. Where such failures have occurred, the Late Sherries were then stripped of their leaves. On inquiry, I find that this coincidence was pretty constant wherever a few vines have died. The loss of leaves at a time when assimilative functions are at their highest caused a grave disturbance. The canes naturally did not summer; and while the roots feed the upper portion of the plant, the leaves in turn feed the roots. The roots, through the loss of the leaves, were unable to get their supply of hydrocarbons. Furthermore, they found themselves for quite three months in ground over-saturated with water. Roots breathe, and must breathe. Under the circumstances, there is little wonder that a few vines have succumbed. We have seen that Late Sherry vines died when grafted on phylloxera-resistant stocks, when on their own roots, and when grafted on other European vines. The proportion of loss in each case is about the same as the acreage of vines planted. Furthermore, there are certainly a few faulty grafts, which are common not only in Australia but also in Europe. Faulty grafts do not always fail within four or five weeks after the operation; sometimes they go on for three or four years, when the



Two Vineyards on Phylloxera-resistant Stocks in the County of Cumberland.

Black Hamburg, grafted on Riparia Gloire de Montpellier.

Black Muscat Hamburg, grafted ten years on Riparia x Rupestris No. 3306.

knitting of the tissues of stock and scion is but partial. Such grafts gradually die back; and if climatic conditions are persistently adverse for a length of time, are first affected, and deeply so.

I also find the Late Sherry this year has generally a small crop, and the vegetation is comparatively poor. Last year these vines had a very heavy crop—in fact, too heavy. Furthermore, the canes did not summer properly, having all the leaves dropped. The effect of the loss of leaves may be compared to the effect of a hailstorm, which strips the vines of their leaves, and mortifies and smashes canes. We know that the effects of a hailstorm are not only felt during the same season through the loss of the crop, but extend to the following season.

From the canes which did not ripen, having lost their leaves in summer, growers got scions last spring to do their grafts on the resistant stocks planted the previous year. In my opinion, this is one and the main cause why the grafts done in September and October last year are not coming on as quickly and as vigorously as usual.

This should be sufficient to dispose of the charge that phylloxera-resistant stocks have caused the losses which occurred in Late Sherry vines. Unfortunately, such attacks upon the introduction of these stocks must be still expected, as some successful growers discourage other people from reconstructing their vineyards. In one instance a grower told a would-be planter that the Department charged for the vines at the rate of £5 per thousand. In other cases it has been said that the grapes have not the same flavour, that they have smaller berries, and so on. If one can assign a reason for this extraordinary conduct on the part of men who have themselves admitted to me that they have received great pecuniary advantage from the stocks, it would be a desire to limit competition. In phylloxera-infested districts it is only those vines which are grafted on phylloxera-resistant stocks which will remain permanently productive, and by limiting the number of vines so planted, these men certainly limit the annual crop; but the policy of the Department is to have all vineyards within infected districts reconstructed on resistant stocks, so that the parasite may cease to do injury to the industry, and, for want of a host, perhaps vanish from the State altogether.

Success with Phylloxera-resistant Stocks.

The following examples are taken from my notes of a number of vineyards within the County of Cumberland which I visited during the past few months. They will serve to show that vignerons have no cause to complain of the results of following our advice, and that they themselves express satisfaction with the stocks:—

VINEYARDS IN SAND.

1. *Elderslie, Camden.*—The soil is pure sand. About 1 acre is rather coarse sand, of light yellow colour. Here Black Muscat Hamburg is grafted on Riparia Gloire de Montpellier and Riparia x Rupestris, Nos. 3,306 and 3,309. The grafts are now ten years old. Vines are planted 5 feet 6 inches

x 5 feet 6 inches, and bear splendid crops The average yield is about 3 tons per acre. They have not been manured since the owner bought the place six years ago, but he sees the necessity of applying some fertilisers.

Another 1½ acres of vines were planted in winter 1910, in sand quite similar to that at the Hunter Valley Viticultural Station. The young vines planted are all resistant stocks, to be grafted next spring. The ground had another vineyard, twenty-four years old, which the previous owner had neglected. The young phylloxera-resistant stocks are all coming on well, while a few ordinary vines, planted on the same soil as a separate patch, are not by any means progressing so well. They seem to feel more the effects of the exhaustion of the ground caused by the old vineyard.

There is another block of about half an acre of vines, twenty-six years old, also in sandy soil, which had been somewhat neglected by the previous owner, but which the present owner put right, and which now gives good returns.

Questioned as to the effects of the westerly winds, the owner states that the wind has no hold in among the grown-up vines. The sand blows about among the young vines, but without any apparent effect.

2. *Elderslie, Camden.*—About 2 acres of seven-year-old vines are on their own roots in sand like that at Raymond Terrace Station. There is a further half acre on phylloxera-resistant stocks, Riparia Gloire de Montpellier, in the same sand. The grapes grown are Black Hamburg, Black Muscat Hamburg, and Late Sherry. There are also 5 acres of young phylloxera-resistant stocks, a pretty complete assortment of them, planted higgledy-piggledy in sand like that at Raymond Terrace. The ground has a faint slope, and westerly winds catch it, but the owner is not alarmed.

In the lower corner of the block about 200 vines of Late Sherry, *on their own roots*, died, owing to the heavy rains last summer. They were in the sand, but adjoined a swamp area, and the unusually heavy rains flooded them.

3. *Elderslie, Camden.*—There are quite a number of vineyards at Elderslie in sand like that at Raymond Terrace, and splendid vineyards they are. It is not river sand, and it is hard to account for its presence. The curious fact is, that although the growers are fully aware that such sand is immune from phylloxera, they still reconstruct on phylloxera-resistant stocks, because they say they get heavier and better crops.

A section of this vineyard is on its own roots, and is now thirty-three years old, and still in bearing, though, of course, the crop is not now large in comparison with young vines. This is close to the piece of clayey ground where phylloxera was first discovered in New South Wales. Although all surrounding vineyards on soils other than sandy fell gradually under the scourge, these vines in the sand are still bearing.

While the vines are still young, the north-westerly winds wither the young shoots, and they are parched and blistered on the exposed side. The sand blows into heaps against the fence, but it is scooped back. In four or five

Young vines in sand at Camden.

Older vines in sand, being another section of the same vineyard.

Showing the nature of the sand in which vines are planted at Camden.

A Fairfield Vineyard.

weeks the parched and blistered zones disappear as the vines get firmly established. The heaps of sand round the grafted vines to protect the grafts are covered with some heavier soil to prevent blowing.

The owner is taking up the old vines and replanting on phylloxera-resistant stocks, Riparia Gloire de Montpellier, because the grafted vines give a heavier crop. He grows Black Hamburg, Black Muscat Hamburg, Late Sherry, Chasselas, and White Hanneport. He lost no vines through last summer's heavy rains.

4. *Elderslie, Camden.*—About 3½ acres, also in sand. The owner pulled out the old vines, which had ceased to be productive through old age, and tried to grow ordinary vines again, but they would not grow. He planted phylloxera-resistant stocks, and these grew. He has Rupestris du Lot, Riparia Glorie de Montpellier, and Riparia Grand Glabre. The grafts on Rupestris du Lot are the strongest. The two Riparias are much the same, but grafts on Riparia Gloire have the more foliage. The owner is very pleased with the Rupestris du Lot, which grows well in his sand, as it does at Raymond Terrace. The varieties of grapes grown are Black Hamburg, Black Muscat Hamburg, and Late Sherry. No vines were lost through last summer's rains.

VINEYARDS IN LIGHT LOAM.

5. *Liverpool.*—This vineyard comprises 5½ acres, of which 4½ are reconstructed. The oldest grafts are six years old. The resistant stocks are Riparia Gloire de Montpellier, Riparia Grand Glabre, Riparia x Rupestris No. 101^{14}, No. 3,306, and No. 3,309, and Rupestris du Lot. On these are grafted Black Hamburg, Black Muscat Hamburg, Late Sherry, Early Sherry, Gordo Blanco, Muscat of Alexandria, Wax Grapes, and odd sorts, including Gros Colman, Rosa of Peru, Centennial, &c. All are doing well. Through last summer's continuous rains he lost about a dozen Late Sherry vines grafted on Riparia x Rupestris, No. 3,306, and a few grafted on some other stocks. A few rows of these vines on the stocks named did not show the habitual vigour of the variety. They were all in a depression of the ground. The same vine on the same stock in adjoining and parallel rows, but on higher ground, looked as vigorous as ever.

The owner of this vineyard, which looks splendid, is very pleased with it. He clears an average of £60 per acre per annum.

6. *Cabramatta.*—This vineyard of 6 acres is particularly interesting, because among various stocks used for reconstruction there are some of the Franco-American hybrids, which have less resistance to phylloxera than the pure species and their crosses. The vineyard had been destroyed by phylloxera, and all the stocks were planted in the same ground. The pure stocks and crosses are, of course, all doing splendidly, as the soil is a very loose sandy loam. The hybrid stocks were planted six years ago, so that their "practical resistance" has almost been proved. In one more year the test will be complete.

So far, the owner has cleared £60 per acre from his vines. Some of his vines, principally Late Sherry, had died, but having pulled up two, I convinced him that the grafts were defective.

7. *Kirkham's Lane, Camden.*—Here is a vineyard of 3 acres, on patchy soil. It was destroyed under the Vine Diseases Act, but replanted on resistant stocks.

On a black medium loam on a faint slope, Black Muscat Hamburg and Late Sherry were grafted five years ago on Rupestris Metallica. They look and bear splendidly, and the owner is well pleased with them. On the same kind of soil, but on flat ground, there are several stocks of Mourvèdre x Rupestris No. 1,202, and a few Aramon x Rupestris Ganzin, No. 1, which three years ago were grafted with Black Muscat Hamburg. This is doing splendidly on both. In the same soil, Red and White Hanneport, grafted on Riparia x Rupestris, No. 3,306 and No. 3,309, do not seem to do too well; but Black Hamburg and Black Muscat Hamburg both do well on such stocks. Bowood Muscat also does well on them, perhaps better on No. 3,309 than on No. 3,306.

On a piece of sandy loam, Late Sherry and Black Muscat, grafted two years ago on Riparia Gloire de Montpellier, are doing very well. In a light sandy clay, mixed with much gravel, Black Muscat Hamburg and Late Sherry, grafted on Rupestris Metallica and Riparia Gloire de Montpellier, in 1910 and 1911, are doing well.

The owner lost no vines through last summer's heavy rains.

VINEYARDS IN HEAVIER SOILS.

8. *Liverpool.*—This is a vineyard of a little over 2 acres, in a reddish-yellow clay, from light to heavy, hand trenched 22 inches deep. There are about 1¾ acres of vines on their own roots. These have escaped phylloxera so far, though many vineyards not far away have had to be reconstructed on account of the pest. There are only 500 grafted vines, viz., Black Hamburg and Late Sherry, on Riparia x Rupestris, No. 3,306 and No. 3,309. These were grafted in 1907, and have given splendid results. The Late Sherry vines, grafted on Riparia x Rupestris, No. 3,309, have not their usual vigorous growth this year, owing to the summer rains last season, which also affected one vine of Black Hamburg grafted on the same variety of stock, but this has since shot from the crown.

The vineyard is in a kind of small valley, and the crop matures a few days late, so that the owner gets his grapes on the market when the glut is over. It pays him better to grow Black Hamburg than Black Muscat Hamburg. Though he gets 6d. per case less for the former, he can sell 100 cases of Black Hamburg to ten of the other. He receives from 3s. 6d. to 5s. per case for Black Hamburg. The vineyard brings in an average of £50 per acre.

9. *Canley Vale.*—A nice little plantation of 1 acre. Late Sherry, Black Hamburg, and Black Muscat Hamburg, grafted in 1909 on Riparia Grand Glabre and Riparia x Rupestris, No. 3,306. The owner showed me the only two vines which were making a poor growth this year. They were Late Sherry. I examined the grafts, and convinced the owner that they were defective.

10. *St. John's Park.*—Six kinds of assorted resistant stocks were supplied in 1905. Portion of this vineyard is a sort of crab clay, whitish, poor, hungry-looking, low-lying, and mixed with some gravel. On this soil, Cabernet x Rupestris, No. 33, does quite as well as Cordifolia x Riparia-Rupestris, No. $106^{\underline{8}}$, and Solonis Robusta almost as well. On another piece of ground of similar nature, but not quite so bad, Chasselas x Berlandieri No. 41B, and Mourvèdre x Rupestris, No. 1,202, both beat Cordifolia x Riparia-Rupestris, No. $106^{\underline{8}}$, and decisively beat Rupestris Metallica.

Aramon x Riparia, No. 141, and Aramon x Rupestris Ganzin, No. 1, are planted in a chocolate loam on higher ground among Riparias and Rupestris x Riparia hybrids, and are doing quite as well.

11. *Canley Vale.*—This vigneron has Late Sherry grafted on several resistant stocks. He considers Rupestris du Lot the best stock for this vine. He lost a few Late Sherry vines, some grafted and some on their own roots.

12. *Between Fairfield and Wetherill Park.*—In 1907 this vigneron obtained for trial a few rootings of several kinds of resistant stocks, and amongst them he found that Aramon x Rupestris Ganzin, No. 1, Mourvèdre x Rupestris, No. 1,202, and Cordifolia x Riparia-Rupestris, No. $106^{\underline{8}}$, gave splendid results. He propagated these, and reconstructed on them. He cannot speak too highly of them, especially of the first two. He has supplied friends with several thousand cuttings of Aramon x Rupestris Ganzin, No. 1. He has cleared an average of £60 per annum from 1 acre, reconstructed on phylloxera-resistant stocks.

13. *Fairfield.*—This is a vineyard of 10 acres, of which 5 were in bearing last year. More will be in full bearing next year. A number had just been grafted, and a number of phylloxera-resistant stocks had just been planted to be grafted next spring.

This vineyard, like many more in the County of Cumberland, is worth seeing, and would be an eye-opener to many. Although the owner has a large number of Late Sherry vines, not one single vine was affected. Last year those 5 acres produced 3,500 boxes of grapes. Some having been spoilt for the market, were sold to the jam factory at 2s. per box. The remainder were sold at from 3s. to 3s. 6d. per box. Taking an average of, say, 2s. 6d. per box, the 5 acres brought in a gross income of £430.

The resistant stocks on which most of the vines are grafted are Riparia Gloire de Montpellier and Riparia Grand Glabre.

The Fowl Tick.

(*Argas persicus*, Oken.)

WALTER W. FROGGATT, F.L.S., Government Entomologist.

The common fowl tick was probably introduced into this State many years before it was recognised and identified as the cosmopolitan poultry pest. It was first recorded from New South Wales by C. Fuller, in this *Gazette*, in 1896; but was said to have been common in poultry-yards in the Deniliquin district at least ten years before. In 1896 it was known to have gained a footing in Deniliquin, Bourke, and Nyngan, and was probably in many other districts.

It was known at Longreach, Queensland; and specimens collected by Crawford, in Adelaide, in 1887, were sent to the well-known British authority on these pests, A. D. Michael, who exhibited them at a meeting of the Linnean Society of London in July, 1887. He stated that they appeared to be identical with that much-dreaded *Argas persicus*, whose bite is supposed in Persia to cause madness and death. Old travellers have stated that when the native huts became badly infested the inhabitants often burned down their village and moved to a clean place.

Michael published a second note on South Australian ticks in "Natural Science," 1892. Since then it has become widely distributed over all the Australian States.

I have published two articles on the Fowl Tick in this *Gazette*; the first appearing in 1901 (Vol. XII, page 1349), illustrated with a plate showing splintered wood sheltering the fowl ticks. After a general survey of the tick-infested districts of New South Wales, a second article was written entitled "Notes on Fowl Tick and Poultry," in 1906 (Vol. XVII, page 14). As all the reprints of this article have been exhausted, and much fresh information has come to hand regarding the identity and range of these ticks, it has become necessary to revise the previous paper before reprinting, and this article has been virtually re-written in order to bring it up to date.

My identification of our common fowl tick as *Argas americanus*, Packard, was given on the authority of Professor Neumann, of Toulouse, France, to whom I sent a collection of Australian ticks in 1889.

In 1908 "Ticks: A Monograph of the Oxodoidea; Part I—*Argasidæ*," was published by the Cambridge Press under the joint authorship of Messrs. Nuttall, Warburton, Cooper, and Robinson. In this monograph the authors placed two distinct genera in the family, and considerably reduced the number of described species, placing Packard's species, *Argas americanus*, which was originally described from Texas, in 1872, as a synonym of *Argas persicus*, usually credited to the French naturalist Latrielle, but described by Oken, in 1818, under the name of *Rhynchoprion persicum*.

Our common fowl tick will, therefore, now be known as *Argas persicus*, which is almost cosmopolitan in its distribution, having been recorded from different parts of Asia, Africa, America, Australia, and one locality (Ssamjam) in Europe. In Europe its place seems to have been taken by the species *Argas reflexus*, which is a well-known parasite on domestic pigeons in Germany, France, and Italy; has been found in Southern Russia, and once recorded from Algeria. It is only known from one locality in England, and that is the crypt of the Canterbury Cathedral. Professor Westwood exhibited specimens at a meeting of the Entomological Society in London in 1872. The habit of pigeons of frequenting and nesting in the towers of old churches and cathedrals accounts for most of the European records of the pigeon ticks having come from such localities. It is rather remarkable that, while all over the world, except Europe, poultry are infested with fowl tick, it is practically only in Europe that pigeons are subject to pigeon ticks. The pigeon tick, *Argas reflexus*, was first recorded by Fabricius under the name of *Acarus reflexus* in 1794, but was placed in the genus *Argas* by Latrielle in 1796.

We have, besides the introduced fowl tick, an indigenous species which is only found in the rubbish in the bottom of the nests of our pretty little Fairy Martins, or "Bottle-nest Swallows," which often mass their curious clay nests along the eaves of houses, under bridges or overhanging rocks. This species was described by me under the name of *Argas lagenoplastis*. (Proceedings of the Linnean Society of New South Wales, Vol. 31, 1906, page 408.) It has probably the same range as its host (*Lagenoplastes ariel*), and I have specimens from Queensland and New South Wales.

The genus *Argas* contains six other species, four of which are found in restricted areas in Africa, another species on the west coast of South America, and the bat tick (*A. vespertilionis*) in Europe and Africa.

In the allied genus, *Ornithodoros*, eleven well established species are described, and three doubtful species are recorded; while, as in the previous genus, a number of other species have been suppressed. They differ from the members of the genus *Argas* in having a convex body when full fed, with the margins rounded, the anterior end more or less pointed, eyes present or wanting, and the larvæ not active. They are chiefly confined to the tropics. Several species, both in Africa and America, attack animals and man. Several are now known to be the transmitting hosts of blood parasites producing tropical diseases; while several are found in Asia—one a parasite of sheep. We have nothing allied to them in Australia

Distribution.

The fowl tick (*Argas persicus*) is widely distributed all over the Australian States, but is more abundant in the dry, warm districts in the vicinity of our inland towns. It is certainly not at home in damp localities or tropical brushes, but given shelter in dry, warm fowl-houses it will soon make good its footing. As far as it can be traced it probably came to Adelaide from the United States or South Africa. It was, as previously noted, first recorded from Adelaide, and gradually spread along the banks of the water highway of the Murray River with the old crates and hen-coops carried on the river boats, until all the towns along that river and its tributaries were infested; and at length, with second-hand crates, it has entered fowl-yards all over the country.

Description and Habits.

The fowl tick, in its adult form, is a dark reddish-brown creature of an oval form, with the back flattened and slightly roughened; the head is hidden under the body, and the tips of the four pairs of legs extend beyond the rim of the body when moving about. The ticks have very similar habits to the bed-bug; for during the day they hide in cracks or crevices between the boards or perches in the fowl-houses; creeping out at night they attach themselves to the fowls and suck their fill of blood, afterwards crawling back to their hiding-places, so that the large ticks are never seen on the poultry in the daytime.

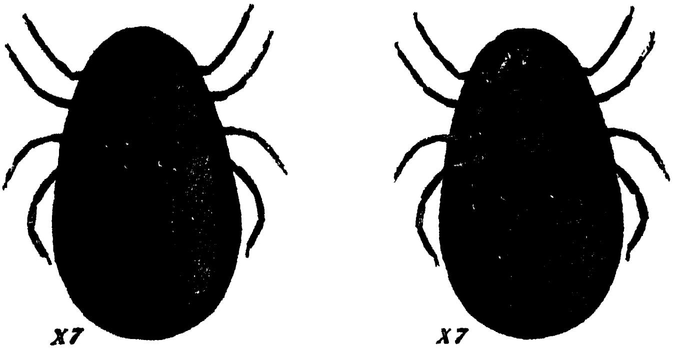
The larval ticks, which hatch out early in September (when they can be found under every bit of bark and wood about the fowl-houses), are greyish-brown, with three pairs of long legs, and are not unlike tiny spiders. It is in this stage that they do the most serious damage, for within a few weeks after birth they find their way out and get into the birds, and bury the mouth parts (which at this stage of growth project in front of the thorax and are not hidden as in the adult stage) in the skin and gorge themselves with blood until they become dull purplish-black, and measure about one-tenth of an inch in length, the body being swollen and rounded. Lounsbury found that most of them were fully fed on the fifth day and ready to drop off, but others, perhaps not so favourably situated on the body for obtaining their food, remained attached up to ten days.

A few hours before parting with its host the larval tick undergoes a remarkable change. The body alters in shape to the flattened disc of the adult form, and so is more adapted for the life it now leads—hidden in cracks or crevices of the fowl-house and nesting-boxes. Here it rests, assimilating the blood it has gorged from the fowl, and casts its larval skin, appearing now with four pairs of legs and the breathing spiracles of the adult. Within a few days of this change the young tick comes out and hunts for food, and, if successful, attaches itself to the bird and feeds upon its blood: but it always leaves its host before daylight, and hurries back to a hiding-place.

In about a fortnight the tick again casts its skin and appears in a fresh suit of clothes. After this moult it again forages round for blood, and again it retires to its hiding-place, where in a few weeks it moults for the third time, and appears a fully-developed fowl tick. These mate, and the female lays its eggs in cracks and hiding-places; they feed in the adult state during the summer-time every month; the female after each feed laying a batch of eggs. As the winter comes round they become more torpid, and later in the season do not feed at all.

The fowl tick has come to stay, and the sooner we realise the fact and set to work to confine it to its present range, and then attack it in the infested towns, the better it will be for the State. The backyard fowl-house of the ordinary householder who keeps a few chickens on the scraps is admirably adapted for breeding ticks, as it is usually built of old packing-cases or rough pine saplings, and sheltered with worn-out corn sacks, for anything is good enough for a fowl-house. It generally rests against a paling fence with a few pepper-trees round about, in which the majority of the fowls roost in preference to their proper house. In many places there is no fowl-house, the fowls roosting on the trees or under the cart-shed, so that in a very short time ticks are carried all over the place.

At Moama I examined an old disused baker's cart under a shed in a yard, where the owner assured me there was no tick in the place, and found, on lifting up the zinc top, that between it and the wood there was a solid mass of adult ticks, from which I could have easily scraped out a couple of quarts in a few minutes.



Upper or Dorsal Side. Under Side.

The Fowl Tick, *Argas persicus*, Oken.

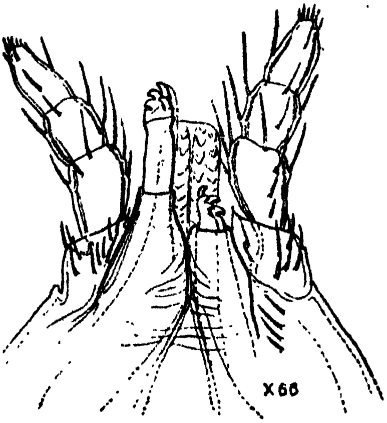
The pepper-trees, on account of their hardy nature, are largely grown in the west, and their rough resinous bark does not retain any moisture but throws the rain off, a condition that just suits the ticks, for they cannot stand water, and are seldom found on exposed walls; but wherever there are dry, sheltering, dark crevices they congregate. Though they have no eyes they are very sensitive to light, and as soon as they are exposed they crawl off under shelter. They are also endowed with a wonderful instinct for finding out fowls, though many probably go hungry for a considerable time where fowls are not numerous. Here again, their powers of fasting come into play and make them a difficult foe to deal with, for they can remain shut up in a tin for nearly two years without anything to eat; and timber, fences, trees, or old disused fowl-runs may be abandoned and lie idle for a year or two, but a few ticks will survive to visit poultry when they arrive. In my former notes I had no record of fowl ticks attacking turkeys or ducks, but I now find that both ducks and turkeys soon become infested, and die if brought into tick-infested premises in the summer.

There are hundreds of places where it is impossible to rear any young chickens or fowls, and if fowls are brought into the town yards from farms still free from ticks they will die within a week or two. The few old fowls that have been bled season after season and dipped in sheep-wash or other compounds, become immune or hardened to ticks, and then can live through everything. The method of spreading tick is not so much to be feared from the introduction of strange fowls into the clean yards, as from the old crates, boxes, and bags that may be full of tick and still not be noticeable. The railway authorities might easily get their crates infested and carry tick all over the State, for they bring quantities of poultry at Christmas from the infested districts.

In Victoria strict measures have been taken to deal with fowl tick, and poultry introduced from New South Wales, or other States in which fowl tick is known to exist, have to be accompanied by a certificate of the Entomologist or Inspectors that they have been passed as free from fowl tick. They have now taken steps to check its spread in their own towns, and all poultry from an infested district are examined and taken to the railway station, where they are placed in crates that have been specially sent up by the buyers, and have not been removed from the station. Inspectors from the Department of Agriculture have visited Benalla and Echuca, and gone over the fowl-houses with the police sergeant (who is appointed an inspector under the Act), and condemned every building in which he has found tick, giving the occupier fourteen days in which to pull down and rebuild the fowl-house, coat the timber with tar, remove all the palings in the fence and treat them in the same manner before they are replaced; all pepper-trees are tarred up to 6 or 8 feet and the tops cut off, so that an inspected town in Victoria where ticks are rampant puts on a half-mourning tint. Special kinds of perches are advocated for placing in the reconstructed fowl-houses, so that ticks cannot get on the birds when roosting at night. The uprights of these perches are made of gas-pipe, driven into the ground; they have a funnel of tin soldered round the centre below the crossbar perch, in which oil or carbolic wash is placed; planed hardwood perches, laid crossways, rest on four gas-pipe corners protected in this manner.

Swinging perches are used in many places, slung on wires from the roof; these are greased to keep the ticks from crawling down to the perches.

The question of dealing with the tick in this State must be faced if our poultry-breeders are to hold the place they have done for so many years in Australia; and the first thing that should be done is a strict quarantine, not only of the fowls in all infested areas, but of all boxes, crates, and bags in the neighbourhood; like the codlin moth with second-hand fruit-cases, the fowl tick's means of progression and extension is in crates, boxes, and bags from infested yards, and not so much on the fowls. If such a quarantine be enforced, the *bonâ fide* poultry-keepers would soon see the advantage of getting rid of, or reducing the tick in their towns, and people would have to get rid of their fowls, or house them properly; but as long as we have no regulations to deal with the matter, hotels, stores, or residences in a country town will have a few fowls running in the yard, laying in the stable and roosting in the cart-shed, so that the whole of the woodwork round the place becomes tick-infested. Where such a state of things exists, there is no reason why fowl tick should not adapt itself to new surroundings, and invade the dwelling-house and get into the baby's cradle. There was, no doubt, a time when the bed-bug of infamous habits, was a dweller in the forests, hiding under the loose bark on the tree-trunks, when it had not learnt the comfort of sheltered beds, or the advantage of living near its food supply; but it is a domestic insect now.



Mouth parts of Fowl Tick.

As I noted in my former paper, there is nothing like coal-tar to fill up the cracks in wood used for building fowl-houses; and if all material is well tarred before it is used, and the whole building treated with the same material after it is built, there will not be many holes or corners for the ticks to hide in. Whitewash or lime is all very well, but when it sets it cracks, revealing cavities into which it has not penetrated, very suitable for the home of the wandering tick.

Piece of old splintered wood, infested with Fowl Tick.

The less wood used in building a fowl-house the better, for in most parts of Australia, as long as the birds are protected from the rain and wind, they do not suffer much from cold. The idea that when the ticks are found in the place it can be closed, or pulled down, or even burnt, and the ticks so got rid of, is erroneous, if the fowls are allowed to roost in the trees, for with all rough-barked trees like the pepper-tree, as I have shown, the ticks are just as well covered as in the abandoned fowl-house, and the fowls will still suffer from their attacks.

Spraying an infested fowl-house with kerosene is effective, when it is thoroughly done, and it should be well sprayed or painted at least twice, and the supply of oil not limited. At the first sign of returning ticks, it should be again treated.

It very often happens that a poultry-keeper, who has never come in contact with fowl-ticks, finds his birds dying or looking unhealthy, and cannot find out the reason. As the ticks only come out at night, he should carefully examine the cracks between the boards or crevices in the walls, and he will, if the place, as usually is the case, has been whitewashed, be soon guided to their haunts by the dirty blotches on the walls, where they have been crawling in and out. In a badly-infested fowl-house, on a warm summer night, he has only to enter the place with a light, and he will see the adult ticks crawling all over the walls and perches after the manner of bed-bugs.

Symptoms.—The fowls mope about, drooping and listless, with their combs and wattles becoming light-coloured. Finally they become weak on their legs, dropping off their perches, and at this stage soon die. Old fowls that recover are lame, and run with a curious hopping motion for some time after they have recovered from the disease.

We now know for a fact, what was previously suspected, that tick affects poultry in two different ways, just as the Queensland cattle tick affects stock. In the first instance, simply being blood-suckers, like bugs, they swarm in a hen-house, and reduce the healthy condition of the birds by "tick worry," loss of rest, and loss of blood.

When, however, the fowls begin to die off, the disease is a much more serious thing to contend with, for the fowl-ticks infesting the poultry-yard are themselves infested with a parasite which they pass on into the blood of the fowl, where it becomes a blood parasite, and the micro-organisms multiply with such marvellous rapidity that in most cases the "fever" causes the death of the bird. Every bird in turn (just like a man suffering from malarial or yellow fever) becomes a centre of infection for every other healthy tick that crawls down and sucks the blood, becoming in turn infected, and transmitting the blood parasites into a fresh victim.

This disease is known as *Sphirochætosis* in fowls, and is caused by a blood parasite which Messrs. Marchoux and Salimbeni discovered, when studying the diseases of fowls in Brazil in 1903. This blood parasite was first called *Spirillum gallinarum*, but both generic and specific names have been dropped, and it is now known as *Sphirochæta Marchouxi*, Nuttal. This tiny organism is conveyed from sick to healthy fowls through the bite of *Argas persicus*, the incubation period ranging from four to nine days; and the ticks are capable of transmitting the disease to healthy poultry five months after feeding upon the blood of *Sphirochæta* infested fowls.

All poultry, fowls, ducks, geese, turkeys, and guinea hens are subject to this disease. Sparrows and doves contract the disease, and die in a similar manner.

A great deal of interesting information has been published during the last few years from different parts of the world, showing that this poultry disease has a world-wide range. Dr. Balfour has written upon this disease in Soudan, in the Third Report of the Wellcomb Research Laboratories, Khartoum, "Spirochætosis in Soudanese Fowls," 1908.

Dr. A. A. Brown, of the Agricultural Department of Victoria, published an article on the fowl tick in the *Journal of the Department of Agriculture*, 1902, and through his advice the Department took active measures against the pest within the State. A Tick Act was passed, making it compulsory for exporters sending poultry from neighbouring States, where fowl tick was known to exist, to obtain certificates from the Entomologist that the birds sent were free from fowl ticks. South and Western Australia followed suit, and enacted similar Tick Acts for the protection of their clean areas. More recently Tasmania has included fowl tick in its Diseased Animals Importation Prevention Act, which came into force in January, 1911.

The authorities in Victoria have put the members of the Sydney Homing Pigeon Clubs to a considerable amount of inconvenience by requiring them to obtain certificates before sending their pigeons through Victoria. As the fowl tick has never been found upon pigeons, and apparently will not go upon them of their own accord, while the European pigeon tick has never been found outside Europe and Algeria, it seems to me that the regulation relating to pigeons and birds other than poultry could be well rescinded without endangering the poultry industry of our adjoining States. The farce of examining a thousand or more prize pigeons by lamplight in a crowded railway-shed, closely enough to detect tick, with the porters waiting for the crates, must be apparent to anyone.

ROYAL AGRICULTURAL SOCIETY'S ANNUAL, 1911.

THIS is the sixth issue of the official publication of the Society, and is a handsome volume of 396 pages. In addition to full particulars as to prize winners in the various sections, and illustrated notes on many stud farms and stations from which successful exhibits came, there are informative articles on such subjects as "Meat Trade in N.S.W."; "Mixed Farming in Riverina"; "Agricultural Motors"; "Horse-breeding in N.S.W."; and many other live-stock and agricultural questions of the day. Five coloured plates of stud animals are included amongst the numerous illustrations.

Dicky Rice.

(*Prosayleus phytolymus*, Olliff.)

THROUGH the courtesy of Mr. R. E. Peck, of Comleroy Road, some experiments have been conducted with arsenate of lead as a spray to check this serious pest of certain parts of the Hawkesbury fruit district. The matter has been under the control of Mr. J. G. R. Bryant, Assistant Fruit Expert, and the results seem to indicate that with thorough spraying the pest can be prevented from doing any serious injury.

This insect was identified by Mr. A. S. Olliff, late Government Entomologist, in the *Gazette* for April, 1895, page 259, under the heading, "Some Australian Weevils, or Snout-beetles." Mr. Olliff said :—

> Another highly destructive insect is the bud-eating weevil (*Prosayleus phytolymus*, Olliff), which commits great havoc in orchards by its depredations on the buds and tender shoots of the orange, lemon, and peach, and by gnawing the rind of the fruit, especially of the orange. During recent years these small beetles have been very troublesome in the Kurrajong district of New South Wales, where they are popularly known as "dicky rice," a term which does not appear to be particularly euphonious or appropriate, nor to have any special significance. At present, nothing is known of the life-history of this insect, but in the adult stage it is a highly injurious species, and its attacks are commonly followed by fungi, which live on the scars formed by the weevil on the rind of the fruit.

In a footnote describing the insect, Mr. Olliff added :—

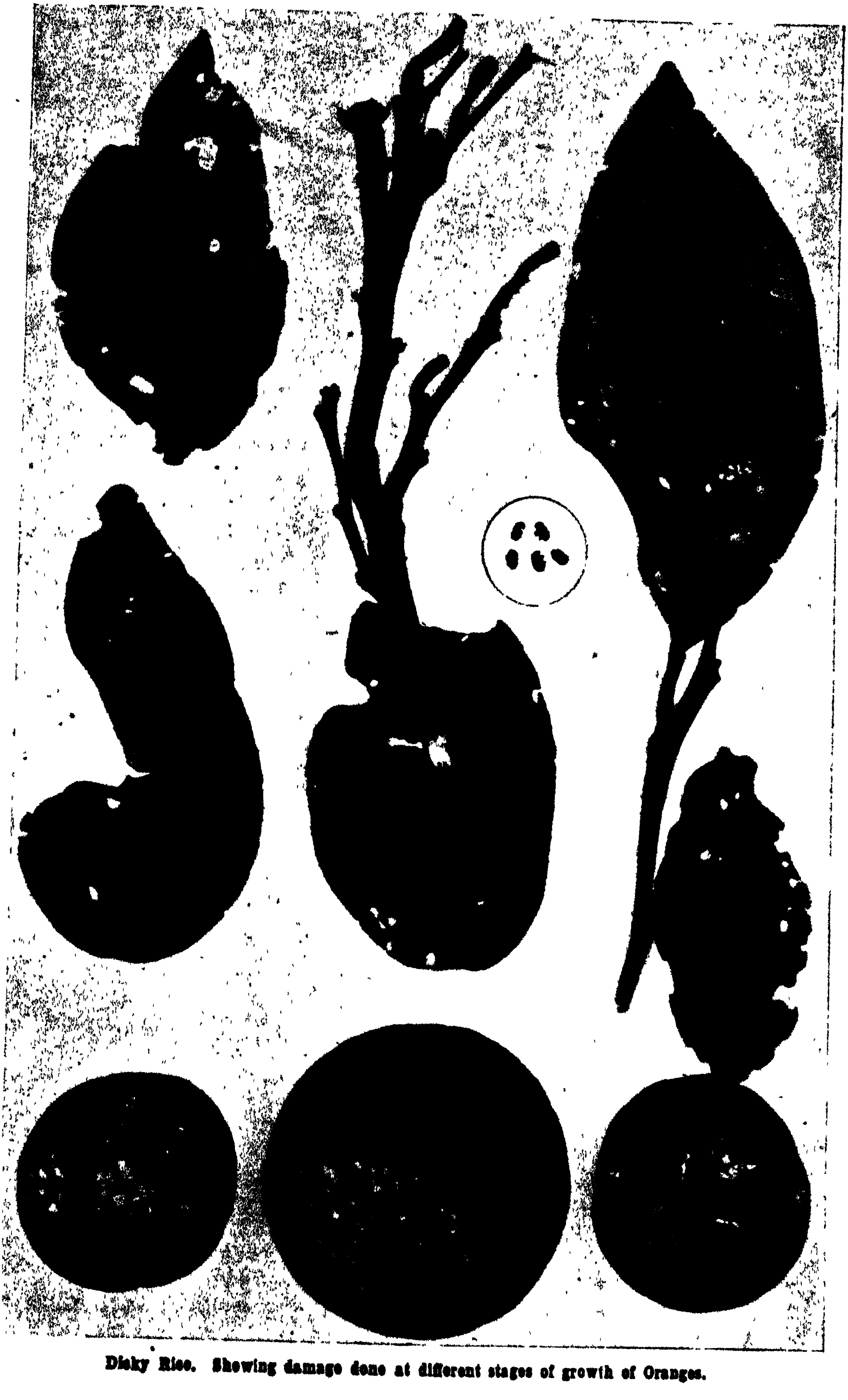
> Kurrajong, New South Wales. Very abundant in August and September, eating the buds and young shoots of peach, orange, and various garden plants; also found in February, eating the rind of oranges.

In October, 1910, Mr. H. A. Wood, Fruit Inspector, reported that Mr. Peck had sprayed the previous season with arsenate of lead for dicky rice. Mr. Peck was sure he had killed great quantities, but thought the spraying should be done two or three times. Arrangements were then made for a trial to be conducted by Mr. Bryant in Mr. Peck's orchard. Two sprayings were given, and on 9th December Mr. Peck reported that were still a few of the pest on the trees. A third spraying was given on 20th December. On 2nd January, 1911, Mr. Peck reported :—

> The arsenate of lead for dicky rice is a very great success, and shows no ill effect to either fruit or foliage. Hardly a mark of the insect is visible on the fruit.

On 11th March, 1911, Mr. Peck stated that the fruit was again showing signs of the dicky rice being at work, but not to a great extent. A final spraying with arsenate of lead was then given, and on 8th May, 1911, Mr. Peck reported :—

> A good many of the oranges appear to be burnt with the arsenate of lead, as they have a dry scab on the under side and are falling off. Only the trees that were treated are affected.



Dicky Rice. Showing damage done at different stages of growth of Oranges.

Specimens of the damaged fruit were thereupon taken and submitted to the Bureau of Microbiology, when the following report was received :—

> Various fungi are present, viz., *Colletotrichum penicillium*, *Phoma*, and *Hormodendron* on the dead spots. The first is the most abundant, and is allied to various fruit-rotting fungi. It is not unlikely that these have gained entrance through an injured surface.

Mr. Bryant, in his report at this time, says that the condition of the fallen fruit appeared to be caused by the spray, but that the dry spell and lack of cultivation were very probably contributing causes to the loss sustained. He states, on 14th May, 1911 :—

> The fruit on the sprayed trees is very clean indeed, and there is only a small percentage marked by the dicky rice weevil. There is a crop of about twenty gin cases on the trees, and from these about one case has fallen. The fallen fruit is marked with a brownish-black spot. There is no sign of this marking on the unsprayed trees. In my opinion the spray has given excellent results in checking dicky rice weevil.

Mr. Peck's opinion is that the last spraying was too late and the fruit too far developed. He marketed thirty-nine bushel cases and destroyed six gin cases. The fruit from the sprayed trees was quite 75 per cent. better than from the adjoining trees unsprayed.

It was considered that the results obtained were such as would warrant a further experiment this last season, and Mr. Peck willingly agreed to this. The results are shown in the following report by Mr. Bryant, dated 9th January, 1912 :—

> I visited Mr. Peck's orchard on 3rd November for the purpose of making an application of arsenate of lead for the control of dicky rice. Twenty-four trees were sprayed in the middle of the orchard, where the dicky rice were very bad. These trees were not treated the season before. Arsenate of lead was used at a strength of 2 lb. to 50 gallons of water. The fruit was the size of marbles, and the dicky rice were working freely.
>
> I again visited Mr. Peck's orchard on the 4th January, for the purpose of giving the trees a second application of spray. Upon examining the trees that had been sprayed, and comparing them with the unsprayed, there was a marked difference. The fruit and foliage and the new wood on the sprayed trees were free from any injury whatever; in fact, it was most difficult to find any trace of the insects' work. There were, however, on one tree, where the limbs were lying on the ground, marks on the fruit where the insects had been working. The unsprayed trees, planted 20 feet away from the sprayed ones, showed marked effects of the work of dicky rice. The foliage and new growth were also badly damaged, and on the butts of trees could be seen dozens of these insects. I collected over thirty insects from one tree.

Agricultural Bureau of New South Wales.

(NOTES COMPILED BY E. HARRIS.)

Branch.	Honorary Secretary.
Bathurst	**Mr. J. McIntyre, Orton Park.**
Bonville	**Mr. H. B. Faviell, Bonville.**
Cardiff	**Mr. D. Straker, Cardiff.**
Carlingford	**Mr. D. K. Otton, Carlingford.**
Coreen-Burraja	**Mr. H. Vickers, Coreen.**
Cundletown	**Mr. S. A. Levick, Roseneath, Cundletown.**
Dubbo	**Mr. T. A. Nicholas, Dubbo.**
Dunedoo	**Mr. G. E. Alexander, Dunedoo.**
Forest Creek	**Mr. W. Thompson, Forest Creek, Frogmore.**
Gunning	**Mr. E. H. Turner, Gunning.**
Hoxton Park	**Mr. E. Banks, Hoxton Park.**
Inverell	**Mr. W. A. Kook, Rock Mount, Inverell.**
Jiggi	**Mr. D. Gibson, Daru Farm, Jiggi.**
Katoomba	**Mr. C. Wooller, Oliva Park Farm, Katoomba.**
Keepit, Manilla	**Mr. J. B. Fitzgerald, Keepit.**
Kellyville	**Mr. T. Glasgow, Kellyville.**
Little Plain	**Mr. F. S. Stening, Little Plain, *viâ* Inverell.**
Lower Lawrence	**Mr. E. T. Cooney, Lawrence.**
Milbrulong	**Mr. O. Ludwig, Milbrulong.**
Nelson's Plains	**Mr. V. Schlaadt, Nelson's Plains.**
Orchard Hills (Penrith)	**Mr. H. Basedow, Orchard Hills, *viâ* Penrith.**
Parkes	**Mr. John E. Russell, Parkes.**
Peak Hill	**Mr. A. B. Pettigrew, Peak Hill.**
Penrose	**Mr. L. Pieremont, Penrose.**
St. Mary's	**Mr. W. Morris, Queen and Victoria sts., St. Mary's.**
Sackville	**Mr. C. H. Britten, Sackville.**
Spring Hill	**Mr. J. A. Henry, Spring Hill.**
Stockinbingal	**Mr. J. Neville, Stockinbingal.**
Tallawang	**Mr. T. Collins, jun., Tallawang.**
Toronto	**Mr. J. G. Desreaux, "Esmond," Toronto.**
Wagga	**Mr. G. H. Kelsey, "Coolroy," Wagga.**
Walla Walla	**Mr. H. Smith, Walla Walla.**
Walli	**Mr. A. V. Bloomfield, Walli.**
Wallendbeen	**Mr. W. J. Cartwright, Wallendbeen.**
Wyan	**Mr. C. W. Harper, Myrtle Creek Railway Station.**
Yass	**Mr. S. Mann, Good Hope, Yass.**

OBJECTS.

The objects of the Bureau are to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

The Government will subsidise the branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements. Regular monthly meetings should be held, and arrangements made for papers to be read at the meetings by members on various points of local or general interest in connection with agriculture, and these papers should be fully discussed. Whenever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

Common Pests.

The Department is willing to supply to any branch requiring same, a set of insects, being the common pests of the district, if a glass-topped case 10 in. x 14 in., which will cost about 7s., is provided. Arrangements could be made for the case to be obtained in Sydney.

Bathurst.

Mr. J. McIntyre, of Orton Park, has been elected Honorary Secretary of this branch.

On the 15th February, Mr. W. W. Froggatt, Government Entomologist, delivered a lecture on "Vegetable and Fruit Pests and their Treatment," at the rooms of the Agricultural and Pastoral Association in Bathurst. Special reference was made to the life and habits of and the means adopted for eradicating the Pumpkin Beetle, and, generally, the lecture was of a practical nature.

The Dairy Expert, Mr. M. A. O'Callaghan, will lecture to the members on the 21st March.

Coreen-Burraja.

This branch reports great mortality in the mares foaling in the district. Mr. Veterinary Surgeon Palgrave will visit, and give an appropriate lecture on the 27th March, at the Burraja School of Arts.

Forest Creek.

Mr. Veterinary Surgeon Palgrave lectured on 28th February, on "Horses: Their Treatment and Diseases."

Inverell.

At the meeting on the 3rd February, Messrs. W. Coates and Arkinstoll were elected members. The branch is joining with the local Farmers and Settlers' Association for the purpose of holding a picnic some time in May.

Kellyville.

The Kellyville Branch forwards a *resumé* of the papers and discussions which have been held during the last few months. At the October meeting the President, Mr. H. Firth, read a paper on "Plants, and How they Feed." At the December meeting the subject was "Drying and Storing of Persimmons and Plums." In January a discussion took place on the various aspects of poultry-keeping.

On 1st February Mr. T. G. Palgrave, M.R.C.V.S., Veterinary Surgeon of the Department, gave a lecture in the public school on "Colic in Horses, and the Treatment of Wounds more commonly met with on the Farm." The subject was treated in a simple manner, free from too much technicality, and after the lecture many questions were asked, and a general discussion took place. Every office bearer of the branch was present, and the attendance numbered quite eighty.

Mr. G. Bradshaw, Poultry Expert, lectured to the members, on the 21st February, on "Poultry Farming,"

Little Plain.

The Sheep and Wool Expert, Mr. J. W. Mathews, will give a practical demonstration on the afternoon of 7th March, followed in the evening by a lecture. The next day will be devoted to the inspection of the flocks of the members, when practical advice will be given them upon sheep and wool.

Lower Lawrence.

Mr. Dairy Instructor Chapman will lecture on "Cattle and Dairying," on the 5th March.

Milbrulong.

The branch held a meeting on the 29th January, at which the by-laws formulated by the Yass Branch were adopted with some slight amendments. Rule 4 provides for the annual subscription to be 2s. 6d., dating from 1st July in each year, and Rule 8 for the members to meet on the Monday in each month immediately preceding the full moon. The meetings are held in the public school at Milbrulong.

The subject set down for discussion at the February meeting is "Co-operation."

Arrangements are made for the Wool and Sheep Expert, Mr. J. W. Mathews, to give a practical demonstration on the 29th February, to be followed in the evening by a lantern lecture, at which the different varieties of sheep will be dealt with in respect to their merits for the production of wool and mutton respectively. A second visit will be made, when practical instruction will be given amongst the sheep, to be followed in the evening by a lecture on the results of experiments in the different crosses, illustrated by a series of lantern slides.

Penrose

At a recent meeting of this branch, Mr. P. Rush read a paper on the "Destruction of Rabbits and Foxes." He advocated the use of poisoned quince jam in the burrows of the rabbits, and in the case of foxes he found the most successful method to be the laying of a trail by dragging sheep's entrails along the frequented places, bait being placed every 200 or 300 yards. For baits he used sheep's livers, tongues, birds, &c., and powdered strychnine.

It has been decided to increase the annual subscription from 1s. to 2s. 6d. per annum.

Messrs. B. James, O. Hilbert, and Besser have been elected members.

On the 20th February Mr. Veterinary Surgeon Palgrave lectured on "Equine Diseases."

Sackville.

At a recent meeting, Mr. R. Camerini, Manager of the Tizzana Vineyard, read an interesting and instructive paper on "Manures and How to Make them." The discussion was postponed till the next meeting on 1st March. A resolution was passed, "That in the opinion of this branch all stallions failing to secure a certificate for soundness should not be allowed to travel any portion of the State."

The dates of the meetings of this branch have been altered to the Friday before the full moon.

The Department has been asked to send lecturers on "Horse Diseases" and "Poultry."

Spring Hill.

A branch of the Bureau has been formed at this place with the following officers :—Chairman, Mr. John Nesbit ; Vice-Chairman, Mr. William Moad ; Honorary Secretary and Treasurer, Mr. J. A. Henry. The membership fee has been fixed at 5s. per annum, and twenty members have joined.

The next meeting will be held on the 2nd March, when the subject for discussion will be "Wheats and their manures, suited to the locality."

Tallawang.

A Departmental Veterinary Surgeon will give a lecture on a veterinary subject to the members of this branch on Wednesday, the 13th March, provided the necessary arrangements can be made.

Toronto.

At a recent meeting, Mr. Cockburn, one of the members of the branch, gave a report upon the different sprays he had been using for Black Spot on grapes. His experience was that a solution of 5 ounces of saltpetre in 5 gallons of water, sprayed on the fruit so soon as it formed, and again later on, was the most successful, after an application of the sulphur spray in the winter.

The branch has now a membership of thirty.

Wagga.

"Conformation and Unsoundness in Horses" was the subject of a lecture delivered by Mr. T. G. Palgrave, Government Veterinary Surgeon, in the Town Hall, on the 6th February. A keen interest was taken by those present at the lecture, which was illustrated by lantern slides.

Mr. R. Morriss has been elected a member.

Wyan.

Mr. Inspector Marks will lecture to the members on "The Soil," on Monday, 4th March.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

THISTLES IN WHEAT.—"Malabar" (Inverell) : The only way to exterminate the variegated and black thistles is to prevent them from seeding. This can be done by either cutting or ploughing them in just as they are coming into head. In the event of the plants having seeded, the only practical way of cleaning the land is to fallow and cultivate it. In this way the seed will be induced to germinate, and be destroyed by the cultivation. If the paddock is badly infested, I would not advise sowing with a crop this year, as it would pay far better to treat it as above. If you cannot spare the land, it would be better to sow it with maize in drills in the spring and cultivate well between the drills.

With reference to the "black pea" mentioned, we would be glad if you would send in a specimen of this, and we would then be able to let you have a report regarding it.—GEO. VALDER.

AGE OF THE HORSE.—"R.L.C.": The rhyme which you quote is fairly accurate, as such matters go. The articles now appearing in the *Gazette*, however, contain numerous illustrations, and form a much better guide. Of course to tell the age of a horse accurately requires proper tuition and long practical experience, as otherwise the observer is in doubt over such a simple matter as whether the teeth which he is looking at are temporary or permanent; and he is also under other disabilities.—VETERINARY OFFICERS.

WEED APPARENTLY FATTENING PIGS.—"R.A.W." (Richmond River): The plant of which you forwarded specimen is *Portulaca oleracea*, "Pig Weed." It is common in maritime and sandy localities in most tropical countries, extending into the warm parts of the temperate regions, both of the northern and southern hemispheres. It is a useful fodder plant, greedily eaten by stock, especially by pigs. In many parts of Europe and Asia it is eaten as salad (Purslane), and in the early days of Australia, when kitchen vegetables were scarce, it was much used as salad. See *Agricultural Gazette*, Vol. vi (1895), p. 221.—J. H. MAIDEN.

INSECTS ON PASSION VINES.—"F.E.B." (Mangrove Mountain): This is a plant bug, *Agonoscelis rutila*, common on horehound and other plants. Until recent years, it was only known from Queensland; but it is now widely distributed over New South Wales. Where numerous, it would probably do some damage to the passion vines by sucking up the sap. Spreading a sheet on the ground under the vines, and then shaking them, would bring the bugs down, particularly if done in the early morning.—W. W. FROGGATT.

WINTER FEED IN INVERELL DISTRICT.—"A.M.D.": The two varieties of wheat that would, in my opinion, give the best results for green feed at Inverell are Thew and Haynes' Blue-stem. The former is a quick-growing variety, and the latter is a slow-growing one. It is unlikely that either of these varieties would make much growth during the winter months; the only plan would be to sow them both early. Thew would then be ready to cut during the winter months, and Haynes' Blue-stem during the spring. Of the macaroni varieties, either Medeah (bearded) or Huguenot (non-bearded) would be the most suitable. They might be worthy of trial; but I do not think they are likely to give as good results as the two first mentioned.

With regard to maize for green feed, as a rule Yellow Dent has given the heaviest crop in this district. It is rather a late-maturing variety. For an early-maturing variety, Hickory King would be found suitable.—GEO. VALDER.

LUCERNE AT BOWRAL.—"A.G.D.": As a rule the best results are obtained by sowing lucerne alone, and not with a cover crop. It is advisable to prepare the ground thoroughly, early in the season, and, if possible, to apply a small quantity of lime, and then sow the seed in the spring, as soon as the frosts are over.

With regard to water supply for vegetable-growing, it is impossible to advise you without making an inspection of the land. Provided you can get water within a reasonable distance by sinking, this would prove the best method; but it depends upon the height to which the water has to be raised, and the quantity available.—GEO. VALDER.

THE SENSITIVE PLANT.—"J.R.A.": *Mimosa pudica*, the Sensitive Plant, of Brazil, is a thorny plant, exceedingly prolific in its seed-bearing characteristics. It is prostrate in habit, annual, and becomes a pest in hot, moist districts. They are making the best of it in Fiji and parts of Queensland where it is well acclimatised, but I recommend you not to deliberately introduce it into the Richmond River district, as we have better fodder plants.—J. H. MAIDEN.

CATTLE CHEWING BONES AND RUBBISH.—"T.J.J." (Nana Glen): Abundance of good green feed is essential. The following lick is advised:—Bone-meal, 20 parts; crushed salt, 5 parts; powdered sulphate of iron, 3 parts; to be well mixed.—VETERINARY OFFICERS.

PEAR AND APPLE LEAVES DROPPING.—"H.S." (Wyong): The Bureau of Microbiology reports that the numerous brown channels in the tissues of the pear and apple leaves forwarded by you, appear to be the work of some insect. Though a few fungus spores were found, they appear to be of secondary importance. No fungus disease was detected in the apple peel.

Orchard Notes.

W. J. ALLEN.

MARCH.

Cultivation.

WHEREVER the weeds have been allowed to go unchecked, they should be turned under some time this month: and if crops for green manures—such as grey field peas, tares, rape, or rye—are to be sown among the trees, they should be put in as early as possible. If, however, no crop is to be sown, it would be well to allow the land to remain in the rough state after ploughing. It will gradually mellow down and remain in good condition until it is time to plough it again next spring. Growers are still busy marketing their fruit, which, with the cultivation of the orchards and picking up and destroying diseased fruit, in accordance with the regulations under the Fruit Pests Act, keeps them going from early morning until late at night ; but this is only what we anticipate, as harvesting time is always a busy season, be the crops what they may.

Grading and Packing Fruit.

The chief points in grading apples are :—Size, colour, freedom from disease, and uniformity through every case.

The export market generally demands a good, clean, medium-sized fruit, 2¼ inches being about the ideal, as the buyer generally wants what to the trade is known as a good count. Extra large fruit is not desirable, as these are generally coarse, and do not keep so well. As a general rule, three sizes are shipped (2½, 2¾, and 3 inches): with varieties such as Jonathan, that have good colour and do not run large, 2¼ will pay to ship. When grading, any fruit which shows the slightest sign of disease should certainly be thrown out.

It is impossible to over-estimate the importance of grading apples for market. It is a thing which cannot be overdone. Most fruit is practically unsaleable without grading, and the better the grading the better it sells.

At our Bathurst Government orchard, when packing apples the following grades are adopted :—

Extra Choice—3 inches.

Extra fine specimens only, uniform in size, colour, and form, and without blemish.

Choice 1st—2¾ inches.

Good fruit, not so fine as Extra Choice, uniform in size, colour, and form, and practically free from insect, injury, or defect.

Specially selected 2nd—2¼ inches.

Mostly good eatable fruit, uniform, and not conspicuously marked by insect, fungus, or other damage.

Selected 3rd—2¼ inches.

Third grade, uniform, sound, and free from conspicuous injury.

Every grower's pack should be as good as his bond; no topping up, nor filling up corners with small apples: buyers want honestly packed goods, and they are usually willing to pay good prices for such. Each case should be filled with the same grade throughout; a few seconds or culls scattered in with a lot of prime fruit give the buyer an opportunity to discriminate against the whole package, and ruin the reputation of the grower.

Apples must be cool and dry before being packed. Heat and moisture promote decay. Each case should be well filled, with the contents placed firmly and snugly. Every day consignments are placed on the market showing evidence of careless packing. If growers would consider for one moment the average route travelled by a case of apples for market they might be a little more particular. The case is taken from the packing shed and put on the cart: it is then hauled, perhaps, for some miles over the average country road to the railway station. After bumping along in the train for some miles, it is again unloaded and placed in a lorry and hauled for several squares over the city streets to the boat, where it is unloaded again ready for shipment to its destination, when, after some more knocking about, it is opened for the inspection of the foreign buyer, and to compete against the fruit of the world. Unless the case has been well filled and packed before starting, it will reach the market in what is commonly known as "slack" condition. The numerous jarrings received *en route* will have caused the contents to settle and shrink, with the result that the case will only be partially full.

Buyers will not pay the price of full packages for those received only filled in part. Not only is the sale affected in this way, but loose packing invariably causes bruises and the general defacement of each specimen. Too tight packing must also be guarded against, as this generally results in bruising. There is a happy medium in packing that can only be learned by practical experience.

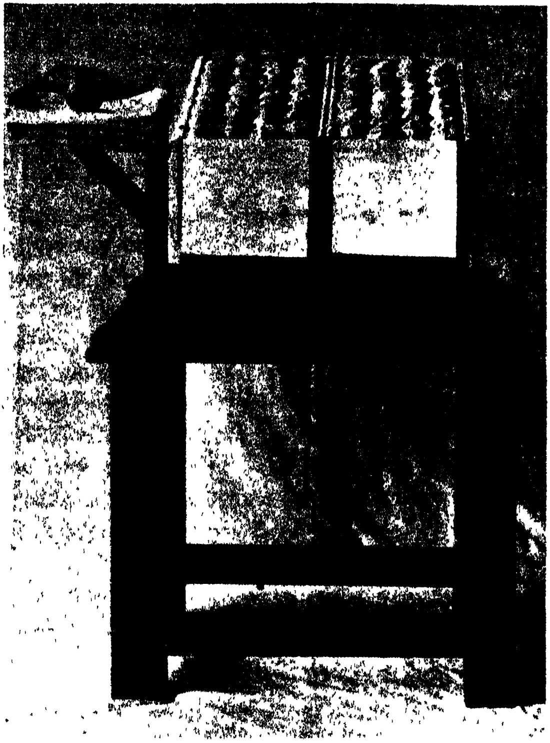
Wrapping.

Whether the apples should be wrapped or not depends somewhat on the variety and the grade of fruit. Wrapping has several advantages :—

1. It serves as a cushion in the case of delicate fruit.
2. It prevents rot and fungoid diseases from spreading from one fruit to another.
3. It maintains a more even temperature in the fruit.
4. The fruit has a somewhat more finished appearance when exposed for sale.
5. Wrappers keep the fruit firm and snug in the packages.

Disadvantages of wrapping :—

1. It adds to the cost of packing.
2. It prevents rapid cooling in cases where the fruit is not cool at the time of packing.



Apple-packing Stand, as used at Bathurst.

The table is constructed of pine, like a kitchen table, so that it will stand perfectly firm and bear a fair weight. Strong ledges or battens are affixed firmly to front and back of the top of the table so that the fruit case may be tilted on the back one and prevented from slipping by the front ledge, as shown. At the left-hand side of the table a stand is affixed, with a ledged tray to carry the wrapping-paper, stencils, &c.

In making the table, the height should be such as to enable the packer to get his hands comfortably into the bottom of the case.

Proper wrappers can be purchased by the thousand for the various-sized fruits, and a 2½-inch fruit should not be wrapped in a paper large enough to accommodate a 3-inch fruit, nor should a 3-inch fruit have a wrapper put on it which has been cut to fit a 2½-inch specimen.

When packing for export, proper tables are necessary (see illustration) for holding the cases during the process of packing.

Strawberries.

The land should be in a good state of tilth, having been thoroughly worked to receive the young plants. If the intending planter has not raised the plants himself he should procure them from a successful grower, and see that the parent plants are strong, fruitful, and free from dieases. Distance of setting depends upon the character of the soil, freedom with which the variety selected sends out runners, &c. In good soils the rows should be from 3 to 4 feet apart, and the plants 18 inches apart in the row. Compactly growing varieties may be planted a little closer. This is called "hill" culture, and consists of growing each plant by itself in a hill, not allowing the runners to grow: consequently each plant becomes stalwart and large, and when properly attended to produces the very finest fruits.

Matted rows.—This system is generally adopted by large growers, as it requires less labour to attend to a large area. By the matted row system more berries are produced on an acre than by the hill culture, but the latter method gives larger and finer berries. The rows are set from 3 to 4 feet apart, and the plants about 15 inches apart in the row. When the runners start they may be so arranged that they form a continuous matted row. The grower can suit himself as to how wide he allows the row to run. Some allow the rows to become 2 feet wide, and others only 1, according to the distance apart the rows have been set. The runners can be kept in check after the row has attained the desired width by using a roller cutter, running up and down between the rows, or by the use of the spade or hoe.

Before planting the new plant, all dead leaves and runners should be removed, and the roots shortened by at least one-third of their length.

The following are the number of plants to the acre, at the distances mentioned :—

2 ft. x 1 ft. ... = 21,780
2 ft. x 1 ft. 6 in. = 14,520
2 ft. x 2 ft. ... = 10,890
2 ft. x 1 ft. 6 in. = 14,520
3 ft. x 1 ft. ... = 14,520
3 ft. x 1 ft. 6 in. = 9,680
4 ft. x 1 ft. ... = 10,890
4 ft. x 1 ft. 6 in. = 7,260

The following list comprises those varieties which at the present time are mostly grown for the best paying results :—Aurie, Annetta, Royal Sovereign, Captain, Trollope's Victoria, Edith, Marguerite, Sir Joseph Paxton, King Edward VII, Dr. Moree, Noble, Sunbeam, Melba.

Fruit Fly and Codlin Moth.

It seems almost incredible that any fruit-grower who is alive to his own interests would allow fly or moth-infested fruit to lie on the ground until the grubs have left them, but such is the case, and it is to these careless growers that we are usually indebted for the breeding and spreading of many of our pests. It is also these growers who give so much extra trouble to our Inspectors under the Fruit Pests Act, in seeing that no neglect takes place.

It may be well for such careless growers to remember that they are a menace to their neighbours, and that by neglecting to pick up and destroy all fallen and infested fruit, they are liable to a fine. Any fruit-grower would be quite justified in notifying the Department whenever he is sure that his neighbours are trying to shirk their responsibility in this matter.

Budding.

It is rather late, but if the month should prove a warm one, it is quite possible that buds would still take if inserted in deciduous trees which are not producing either good fruits or satisfactory crops. Nursery stock may still be budded.

Preparing Land for Planting this coming Winter.

The land has never been in better condition for clearing, grubbing, ploughing, and subsoiling, preparatory to planting, than it is now, and those who intend planting this coming winter, and who have not completed these operations, should lose no time in finishing this work, so that new land will have a little time to sweeten before the young trees are set, as well as to enable the orchardist to complete all planting operations early in the winter.

Acknowledgments.

I have to acknowledge receipt from Mr. Reedy, Manager, Camden Park Orchards, of samples of some of the newer American varieties of apples, which in many cases are fruiting for the first time. They are Winterstein, King David, Rival, Peter, and Yopp's Favourite. The whole of these varieties give promise of proving valuable.

I have received some very fine samples of passion fruit, grown by Mr. V. J. McKenzie, Penang Mt. The fruit opened up in excellent condition, and clearly showed the results of good cultivation; also Mr. G. Weiberle, Oakdale, *via* Picton, forwarded excellent specimens of the following high-class varieties of apples:—McIntosh Red, Jonathan, Granny Smith, Trivett's Seedling, and Pomme de Niege, commonly known as Fanny.

SPRING WHEATS IMPORTED FROM ENGLAND.

IN January, 1911, the Department of Agriculture received from the Agent General in London samples of a number of varieties of "Spring Wheat." These are wheats which are sown in very cold countries during the spring, after the winter frosts have gone. It was thought that they might do better in some of our cold districts than the varieties which we already have.

The varieties received were Sutton's Red Marvel, Dreadnought, Sensation, Carter's Earliest of All, Red Admiral, Improved Red Fife, Red Marvel, and Marster's Perfection. The seeds were divided up and sent to Bathurst, Glen Innes, and Cowra Farms for trial.

At Bathurst the wheats were planted in single rows to test their season of growth, Cleveland wheat being sown as the check variety. Cleveland is a late variety compared with many others cultivated as main crop varieties in that district; but all the imported varieties proved much later than Cleveland. Most of them were three weeks later. They require a long season, and upon this season's showing are too late for Bathurst district.

At Glen Innes also the varieties all proved very late. They were fairly rusty, and the heads failed to fill—due, no doubt, to the hot dry weather when rain was needed for the purpose.

At Cowra the wheats all ripened very late, and Mr. Pridham, Assistant Wheat Experimentalist, considers them useless until crossed with other wheats. They suffer much from drought, and stool too heavily for our conditions. Their good point is their stout straw. A few crosses have been made with them for the sake of their strong straw and prolificness; but with the exception of Carter's Improved Red Fife, they appear to be of poor milling quality, and the straw of this variety does not seem to be equal to that of the others. Most of the wheats shell badly.

The Department has a number of cross-breds made with English wheats some years ago, which are in process of fixation, and in some the shelling habit seems to have been overcome. These appear likely to be prolific; but it will be some years yet before definite results will be obtained.

PALESTINE WHEAT.

THE now famous discovery, by Dr. Aaron Aaronsohn, United States Agricultural Explorer, of what is believed to be the original wild wheat, is being availed of by the New South Wales Department of Agiiculture. Dr. Aaronsohn found the wheat growing on the stony mountain slopes and in the cleft soft rock in the driest portion of Mount Hernon, Eastern Palestine. It is stated that the wheat is found over a wide area, at altitudes which range from several hundred feet below sea level to 6,000 feet above.

Through the courtesy of Dr. N. A. Cobb, late Pathologist of this Department, we were enabled to obtain a half ounce of seed of this wheat from the United States Department. The seed arrived on 17th June, 1911, and was at once sent to Cowra Experiment Farm to be grown by Mr. J. T. Pridham, Assistant Wheat Experimentalist.

Mr. Pridham sowed the wheat on the 17th August, 1911. It turned out to be a very hardy variety, but extremely hard to thresh. It has a black bearded ear, is very late in maturing, and is of no practical use except for crossing with other wheats. He has secured some crossed seeds from it this season.

In the meantime, Dr. Cobb induced Professor O. F. Cook to forward us a further sample of Palestine wild wheat. This arrived on 10th August, 1911, and was at once sent to Mr. Pridham to be grown in due course.

It is impossible to say what practical value this wild wheat will have for New South Wales. In its present state it is not worth growing as a wheat; in fact it is apparently the original plant from which the present cultivated wheats have been evolved by ages of improvement. But ages of improvement have probably weakened the hardiness of the plant, and the original "blood" might perhaps be advantageously introduced into some of our cultivated varieties by crossing. This is the work of the wheat-breeder. Farmers may rejoice that we have been able to obtain the necessary material.

THE MARKET FOR RAMIE.

MESSRS. M. WEEBER & Co., of 61, Mark Lane, London, E C., send the following notes respecting the cultivation of ramie. The notes are published for the information of readers, as tending to show the market for ramie fibre, but this Department does not guarantee the correctness of the estimated yields :—

The cultivation of ramie to-day is a most profitable one, for ramie fibre has acquired during the last few years a position from which it cannot be driven back. Nearly every day in Europe, in the United States, and in other leading industrial countries, new factories for incandescent gas mantles, &c., come into existence, and in this trade alone many thousands of workmen are employed. For the manufacture of these mantles ramie fibre is chiefly used, and this explains the fact that the consumption has increased so enormously, and that the price is so high that it leaves the planter a very good profit.

In England, Germany, Russia, Austria, and Italy, new large establishments for treating the fibre are being erected, so that any quantity finds ready buyers at high prices. Agents for the sale of fibre are Messrs. W. Weeber & Co., 61, Mark Lane, London, E.C., representatives of an international group of financiers, who will buy any available quantity, and give any information required.

The most suitable fibre is the *Boehmeria nivea*. The greatest advantage of a ramie plantation is that it pays for itself very soon, which is not the case, for instance, with a tea, coffee, or cocoa plantation. Whilst the first crop of tea, coffee, or cocoa cannot be looked for before three to five years, ramie is ready three months after planting If the soil is good and the climate favourable, from four to six crops a year may be obtained, so that the average result would be as follows :—On a square rod there grows, according to the condition of the soil and the time of the year, from 1,000 to 1,500 little stems, which reach a height of 2 metres (78 inches). An acre, therefore, produces 160,000 to 240,000 stems. If not so closely planted, the stems are likely to form ramifications and side stems; if they are denser, the stems have not sufficient room for proper development. Those 160,000 to 240,000 stems would yield from 35,000 to 53,000 lb. of green stems, and about the same quantity or a little less of leaves and waste stem ends. The latter remain on the soil as manure. The 35,000 to 53,000 lb of green stems will produce from 2,100 to 3,200 lb. of dried bark, equal to 1,400 to 2,100 lb. of raw fibre in the form in which it comes to market. With the proper choice of soil, six crops per year are obtainable, so that 1 acre may yield from 8,400 to 12,600 lb of marketable fibre.

According to the statement of an experienced planter, a ramie plantation under proper management will pay as follows :—Instead of a crop of 8,400, to 12,600 lb. of fibre, which it is possible to obtain, take a crop of only 4,200 lb. of fibre per acre. In that case, as experience shows, the net profit is £12 to £14 per acre, or, taking a plantation of 500 acres, £6,000 to £7,000 net.

The difficulties which once existed in finding a ready and profitable market for ramie fibre do not exist to-day. The problem of stripping and decorticating it has been solved, as there are to-day several good machines and contrivances which guarantee a cheap preparation of the fibre into marketable condition. Besides this there is also a good demand for the unprepared fibre.

Further information on those points can be had from the firm above named, who are also open to buy any available quantity of ramie fibre, if samples are sent, at the highest market value.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1912.

Society.	Secretary.	Date.
Bangalow A. and I. Society	W. H. Reading	Mar. 5, 6, 7
Narrabri P., A., and H. Association	D. J. Bridge	,, 5, 6, 7
Southern New England P. and A. Association (Uralla)	W. C. McCrossin	,, 5, 6, 7
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 5, 6, 7
Bega A., P., and H. Society	W. A. Zingel	,, 6, 7
Braidwood P., A., and H. Association	L. Chapman	,, 6, 7
Coonabarabran P. and A. Association	G. B. McEwen	,, 6, 7
Berrima District A., H., and I. Society (Moss Vale)	I. Cullen	,, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 7, 8
Nepean District A., H., and I. Society	P. J. Smith	,, 7, 8
Wauchope P., A., and H. Society	A. D. Suters	,, 7, 8
Oberon A., H., and P. Association	A. E. Burcher	,, 7, 8
Wyong A. Association	J. H. Kay	,, 8, 9
Bombala Exhibition Society	W. G. Tweedie	,, 12, 13
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 12, 13, 14
Campbelltown A. Society	F. Sheather	,, 13, 14
Cobargo A., P., and H. Society	T. Kennelly	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 13, 14, 15
Bowraville A. Association	C. Moseley	,, 14, 15
Port Macquarie & Hastings Dist. A. and H. Society	W. R. Stacy	,, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts	,, 14, 15, 16
Blayney A. and P. Association	H. R. Woolley	,, 19, 20
Gundagai P. and A. Society	A. Elworthy	,, 19, 20
Delegate P. and A. Society	C. J. Lamb	,, 20
Gloucester A., H., and P. Association	S. J. Bignell	,, 20, 21
Merriwa A. and P. Association.	A. V. Budden	,, 20, 21
Queanbeyan P., A., H., and I. Association	E. C. Hincksman	,, 20, 21
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Newcastle A., H., and I. Association	C. W. Donnelly	,, 21, 22, 23
Walcha P. and A. Association	J. N. Campbell	,, 26, 27
Luddenham A. Society	F. Shawe	,, 26, 27, 28
Tamworth A. and P. Association	J. R. Wood	,, 26, 27, 28
Molong P. and A. Association	W. J. Windred	,, 27
Cooma P. and A. Association	C. J. Walmsley	,, 27, 28
Yass P. and A. Association	W. Thomson	,, 27, 28
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 27, 28, 29
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 27, 28, 29
Liverpool A., H., and I. Society	W. E. Learoyd	,, 28, 29, 30
Royal Agricultural Society (Sydney)	H. M. Somer	April 2-10
Adaminaby P. and A. Association	W. Delany	,, 10, 11
Bathurst A., H., and P. Association	J. Bain	,, 17, 18, 19
Hunter River A. and H. Association	E. H. Fountain	,, 17-20
Moree P. and A. Society	D. E. Kirkby	,, 23, 24, 25
Richmond River A., H., and P. Society (Casino)	D. S. Gayner	,, 23, 24, 25
Orange A. and P. Association (Jubilee Show)	W. Tanner	,, 24, 25, 26
Dungog A. and H. Association	C. E. Grant	May 1, 2.
Dubbo P., A., and H. Association	F. Weston	,, 1, 2
Kyogle P., A., and H. Society	M. P. Dunlop	,, 1, 2
Clarence P. and A. Society (Grafton)	G. N. Small	,, 7, 8, 9
Coonamble P. and A. Association	J. M. Ree	,, 8, 9
Walgett P. and A. Association	W. Neal	,, 15, 16
Nyngan and District P. and A. Association	R. H. A. Lyne	,, 28, 29
Hay P. and A. Association	G. S. Camden	July 9, 10
Deniliquin P. and A. Society	L. Harrison	,, 18, 19

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Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

WHEAT EXPERIMENTS, SEASON 1911.

SOUTHERN DISTRICT.

H. ROSS, Inspector of Agriculture.

THE experiments just concluded comprised variety trials, manure tests, and trials with seed treated with various fungicides against stinking smut or bunt. The names of the farmers who co-operated with the Department and their addresses are :—

Mr. G. Laidlaw, Jindera, Albury.
Messrs. Hulme Bros., Germanton.
Mr. A. Eulenstein, Henty.
Mr. T. H. Davis, Lockhart.
Mr. J. Miller, Mimosa Station, Mimosa.
Messrs. D. and J. Gagie, West Wyalong.
Mr. M. J. Carew, Deniliquin.
Mr. S. P. Wilson, Jerilderie.
Mr. B. J. Stocks, Harden.
Mr. A. Hannah, Nubba.
Farmers' Union, Gininderra.

Following the practice adopted in previous years, areas of about 10 acres, representing a fair average of the district, were set aside for the experiments, so it will be seen that the experiments were conducted on a fairly large scale, the commercial aspect of the work being always kept in view.

RESULTS OF VARIETY TRIALS.

Yields per Acre.

Seed, 45-50 lb. per acre ; manure, 56 lb. superphosphate per acre.

Name of Experimenter.	Federation.	Marshall's No. 3.	Bayah.	Rymer.	King's Early.	Comeback	Warren.	Thew.	Florence.	Cleveland.	Bunyip
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb	bus. lb.
B. J. Stocks, Harden	36 45	32 0	30 51	22 17	28 4	23 26	.	.			.
Mimosa Station, Mimosa ..	29 16	27 27	26 1	. .	22 52	.	27 5	20 50			
G. Laidlaw, Albury	26 8	..	23 0	24 52	17 26	14 22	20 1	..	..		.
Hulme Bros., Germanton ..	25 57	29 16	31 24	..	26 28	.	25 32	.	28 4		
A. Eulenstein, Henty . ..	21 18	22 33	19 30	..	13 52		.	..	13 37		.
Farmers' Union, Gininderra ..	25 13	28 16	.	27 0	..	25 17	.	.	..	30 0	23 36
A. Hannah, Nubba	21 25	..	21 4	..	21 2	.	..	.	..		20 34
M. J. Carew, Deniliquin ..	13 19	12 33	11 25	..	14 21	.	..	.	13 21		14 0
T. H Davis, Lockhart.. ..	15 15	4 30	15 33	13 31	13 51			.	..		10 12
D. and J. Gagie, Wyalong ..	21 8	23 1	19 8	20 0	20 6		22 8	.		.	.
S. P. Wilson, Jerilderie ..	9 7	7 15	7 44	...	7 45	..	7 9	..	2 8	.	
Average	22 16	20 46	20 34	21 32	18 46	21 2	20 23	20 50	14 13	30 0	17 5

Federation and *Rymer*, with an average of 22 bushels 16 lb. and 21 bushels 32 lb. per acre respectively, proved the best yielders; and that their yielding qualities are consistent is proved by the fact that in the experiments for three consecutive years these two varieties have come out on top.

A comparatively new variety, *Bayah*, gave very encouraging results. As it stands in the field, Bayah resembles Federation very much; in fact, at first sight, it is difficult to tell one from the other. Bayah stools out better than Federation. In its early stages it is a very vigorous grower; the straw is slightly longer than Federation, and it carries more heads to the acre than a crop of Federation. Although the heads are well filled, they do not contain the number of grains that are to be found in Federation.

In some instances, notably at Germanton, Bayah eclipsed all the other varieties in yield. It is any easy wheat to strip, and it is quite as storm-resistant as Federation.

Marshall's No. 3 is such a consistently good yielder and such a fine dual-purpose wheat that it should find a place on every farm. It should be borne in mind, however, that it is essential to sow this variety early in the season.

Warren, though it has proved a fair yielding wheat this season, is rather weak in the straw, and for that reason cannot be recommended as a main cropper.

Of the early ripening varieties—*Comeback*, *Bunyip*, and *Florence*—the first-named gave best results. Bunyip, though an excellent wheat for late sowing, is weak in the straw, and only limited areas of this variety should be sown.

In connection with these early ripening varieties, it may be well to point out again that they should invariably be sown *late* in the season. Failure and disappointment will be guarded against by following this advice. The reason why Comeback, Florence, and Bunyip have not found greater favour with farmers is largely due to these varieties having, in many instances, been sown too early. By increasing the quantity of seed up to 60 lb. per acre, these wheats can safely be sown up to the end of July and even into the middle of August. Of course, it must be understood that none of them are being recommended for a main crop.

King's Early is an unsuitable variety for the Southern district, its chief disadvantage being a heavy beard.

Confirming previous results, *Cleveland* again proved the best cool climate wheat.

Experience has shown that to select the right kind of wheat the farmer must not be guided by yielding qualities only. Many varieties are good yielders, but very often possess such undesirable features as being liable to lodge or prone to shell their grain.

The need for a storm-resistant variety has of late years never been more apparent than during the harvest just concluded. The varieties which stood the stress of the severe weather best were Federation, Bayah, and Marshall's No. 3.

Amount of Rain needed to produce a Payable Wheat Crop.

Regarding the number of inches of rain needed for the production of a payable crop, some valuable lessons have been learned during the past season. Generally, farmers contend that from 10 to 12 inches are essential during the growing period of the crop. That, however, good crops can be grown with a far less rainfall than that has been clearly demonstrated by some of the experiments.

In the experiment plot at Wyalong, the total rainfall from the time the seed was sown until the crop was harvested was 668 points. The yield of the plots went as high as 24 bushels per acre.

At Jinders (Albury), with a rainfall of 752 points, an average yield of 22½ bushels per acre was obtained, and Federation went as high as 28 bushels 56 lb. per acre.

More remarkable still are the results from the Deniliquin plots, which were sown on the 1st and 2nd of May. In this case the total rainfall amounted to only 322 points, distributed as follows :—

May ...	210 points.	September ...	37 points.
June ...	60 „	October ...	3 „
July ...	12 „	November ...	Nil.
August ...	Nil.		

Still the payable yield of 14 bushels per acre resulted.

In every one of these instances the land was fallowed and worked with cultivator and harrows, so as to leave a loose dry mulch on the surface. A large amount of the previous year's rainfall was thus stored and conserved in the soil, so that practically two years' rainfall was employed in the production of one crop. Surely such results should leave no further doubt in any farmer's mind as to the necessity for thoroughly working his fallowed land.

Manure Tests.

In the manure trials, plots were sown with 28 lb., 56 lb., and 84 lb. of superphosphate respectively ; and for comparative purposes some plots were left unmanured. From the results obtained, it appears that on new land, or land which has been cropped only a few times, an application of 56 lb. per acre is ample. On land, however, which has been cropped continuously for a number of years, an application of 84 lb. per acre resulted in an increased yield.

In nine cases out of eleven, 56 lb. proved more beneficial than 28 lb., and in every instance has the addition of 56 lb. per acre yielded a far heavier return than the unmanured sections.

Result of Manure Trials.

Yield in bushels.

Locality.	No Manure.		28 lb. Superphosphate per acre.		56 lb. Superphosphate per acre.		84 lb. Superphosphate per acre.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Harden	29	6	36	49	36	45	37	5
Mimosa	20	50	28	59	29	16	26	52
Albury	19	38	28	56	26	8	28	6
Germanton	17	9	19	8	25	57	20	0
Henty	11	45	15	37	21	13	27	55
Gininderra	18	17	17	44	23	37	....	
Nubba	15	2	18	20	21	25	20	23
Deniliquin	10	24	....		13	19	14	34
Lockhart	4	28	11	27	15	15	15	45
Wyalong	18	4	19	38	21	8	24	2
Jerilderie	6	5	7	12	9	7	7	48
Average	15	31	20	23	22	7	22	15

The average yield of the unmanured plots, it will be seen, is 15 bushels 31 lb. per acre; that of the plots manured with 56 lb. of superphosphate is 22 bushels 7 lb. per acre, an increase in yield of 6½ bushels per acre, worth over £1 in cash value, for an outlay of 2s. 6d.

Valuable as the uses of artificial fertilisers are, it must not be thought that manuring will make up for deficient and faulty cultivation. The best results from artificial manuring are invariably obtained on well cultivated soils. Good cultivation and manuring go hand in hand, and one is useless without the other.

Treatment of Seed Wheat for Smut.

Ten experiments were conducted with seed pickled with bluestone and lime, and seed treated with Fungusine, respectively. In the majority of cases the Fungusine-treated plots germinated more quickly, and the plants showed better growth in their early stages than those in the bluestone-treated plots. However, there is not much difference in the yield, as will be seen by the following figures:—

Average Yield per acre from Ten Plots.

	bus.	lb.
Bluestone-and-lime-treated seed	22	17
Fungusine-treated seed	23	3

Summary.

Reviewing the whole of last season's experiments, we find that the results obtained are more than double the average of the State, notwithstanding that some of the plots were situated in districts where last season's rainfall was considerably below the average.

The explanation of the success is that the seed was sown not only on fallowed land, but on fallowed land that had been constantly worked *on top* in order to keep the moisture *below*.

The difference in the yields of crops grown by different men in the same district is often so remarkable as to call for special comment. When inquiries are made as to the cause of the other man's success, the invariable answer is: "Oh, yes! but look at how he worked his land to get such a crop." Is this not a very significant reply?

The wonder is that a practice which is so universally admitted to be the proper one is not more followed than it is. So much has been said, written, and proved regarding the absolute necessity for fallowing wheat land and keeping the surface soil thoroughly worked during summer months, that it seems almost incredible that only a small percentage of farmers follow this practice in its entirety.

It is a deplorable fact that, proportionately, less land was fallowed last season in the Southern district than there was in 1909 and 1910. The reason for this is that the phenomenal seasons of 1909 and 1910 have made farmers careless in their methods. Fair crops were obtained in these two years on unfallowed land, but surely practical men must know that such seasons are abnormal and not likely to recur often.

The season just concluded has been a bitter lesson to those who put their faith in non-fallowed land. Thousands of acres have yielded less than 6 bushels per acre, not sufficient to cover cost of putting in and taking off the crops. Side by side in every district in the south are to be met instances where the crop on non-fallowed land is hardly worth stripping, whereas the yield on adjoining fallowed land is 20 bushels or more per acre.

By no means is the conservation of moisture in the soil the only advantage gained by fallowing. Those interested in wheat-growing will remember that ploughing last season could not take place until towards the end of May, when the first rain fell, consequently seeding operations were deferred until July or later. The man, however, who had fallowed land at his disposal had his sowing completed *before* the rain came, thus ensuring a good start for the young plants.

Farmers awake, and look to your interests! Let every wheat farmer make a firm resolution, no matter what happens, to fallow at least two-thirds of the area he is prepared to put under crop. That done, the miserable average of 10 bushels per acre for this State will soon be a thing of the past.

NORTH-WEST DISTRICT.

A. H. E. McDONALD, Inspector of Agriculture.

The 1911 season was a most unfavourable one for the wheat-grower in the North-west. Between seeding and harvesting, the rainfall generally ranged from 5½ to 7½ inches approximately.

Collectively, it is doubtful if the average yield for this division will be much more than 7 bushels per acre. Although the rainfall was so extremely low, it was fortunately fairly evenly distributed; otherwise the yields would have been even lower. In May, sufficient rain fell to cause germination, but June was somewhat dry, and in some fields a good deal of the young wheat perished. This made much of the wheat thin. During the latter part of the season a fair rain was experienced, but the crops were, in most cases, so far advanced, that full benefit was not derived from it.

Whilst the rainfall was very low during the wheat-growing season, it was, on the other hand, high in January and February; and in every case where efforts were made to conserve the moisture by summer fallowing, the yields were much above the average, and in some cases extraordinarily good. For instance, at Quirindi and Pallamallawa, 42 and 32 bushels respectively were garnered per acre, although only a little over 6 inches of rain fell during the growing season. The land at both places was treated almost identically, and the fact that these were practically the best yields of the district indicates the value of the treatment.

The season showed unmistakably that well cultivated land gave the best crops. Wherever a good paddock of wheat was harvested, land had invariably been well prepared. The rainfall of the growing season in itself was altogether too small to produce good yields; but augmented by conserved moisture from the summer rains, it was sufficient to produce fair to maximum crops. Wherever land was left unploughed, after the summer rains, for any length of time, it became quite dry, and the crops were in consequence poor; but in every case where the land was ploughed before the summer rains, or immediately afterwards, the yields were very fair. The best yields were obtained where the ploughing had been done before the rain, and the land kept lightly stirred afterwards up till seeding.

It is only by the adoption at once of some such system, that farmers in the North-west can expect to become successful wheat-growers. It can hardly be claimed that wheat-growing has been successful in the past in the true sense of the term. Too many failures have been recorded, and the returns of the good years have been eaten up by the bad. The district enjoys what is apparently a high average annual rainfall; but it is very erratic in its distribution. In some years the rainfall is extremely favourable in the wheat-growing season, and good crops are obtained, no matter how the land has been prepared, while in others, as in last, it may be very unfavourable. The year's rainfall was fairly good, but most of it fell during the summer months, and was to the bad farmer practically useless. As statistics show that in the North-west a season such as last, with its low winter rain, and high summer rain, occurs approximately once in every three years, farmers have the prospect of a partial failure in one out of every three crops they take from the land. The rainfall figures of the past, however, show that it very rarely happens that both summer and winter rains fail, so that those farmers who work their land under a system which will enable them to conserve the summer rain, have very little cause to fear.

The results of the experiments show how necessary it is to select suitable varieties. The difference between the best and poorest varieties was approximately 19 bushels in the most pronounced case, and 4½ where the least occurred. At the same time, too much stress cannot be laid on the fact that farmers are inclined to expect far too much from variety. No matter how highly a wheat is capable of yielding, a payable crop is impossible from it, unless the land is well worked. Cultivation must come first, and the man who expects to get good crops without giving it, by merely selecting good-yielding varieties, is not much more sensible than he who would try to make a starving man well by giving him medicine. Selection of good sorts is very important; but, nevertheless, the man who cultivates his land well could in most cases take the poorest varieties and yet get as good a yield as the careless farmer would get from the best.

The experiments show the necessity of keeping up the strength of a variety by the introduction of fresh seed. At Wee Waa, local seed of Marshall's No. 3 was grown adjacent to fresh seed, and gave 8⅓ bushels less per acre. At Narrabri, local seed of Comeback gave 1 bushel per acre less than fresh selected seed.

Very little benefit has apparently resulted from the use of fertilisers. In some instances slight increases were obtained, while in others the yields from the plots which received no manure were larger. It would seem that the land of the North-west is naturally well fitted to supply all the plant-food required by the crop.

Rainfall Table.

The following table shows the rainfall at six centres in the North-west during the time the wheat was growing. The figures are fairly indicative of the average rainfall of the past wheat seasons.

Month.	Quirindi.	Pallamallawa.	Tamworth.	Boggabri.	Wee Waa.	Narrabri.
1911.						
April	..		26	...	..	..
May	125	150	79	140	156	104
June	17	24	44	38	23	27
July	215	71	153	119	143	163
August	110	218	63	115	214	82
September	...	108	222	208	20	59
October	141	70	179	66	93	142
November	20	...	.	..	. .	...
Total	628	641	766	686	649	577

Results of Farmers' Experiments with Wheat in the North-west—Season 1911.

Variety.	Quirindi.		Delungra.		Palla-mallawa.		Tamworth.		Barraba.		Curlewis.		Boggabri.		Wee Waa.		Narrabri.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Federation	42	6	37	0	30	44	10	45	9	35	9	52	12	1	10	52	13	36
Marshall's No. 3	41	14	....		32	0	13	31	18	13	12	10	19	0	21	44	....	
Rymer	41	48	34	0	....		12	53	....		....		....		....		....	
Comeback	23	46	24	3	24	22	8	57	10	48	7	10	....		10	27	9	10
Warren	27	28	25	18	....		13	2	....		....		....		....		10	20
King's Early	28	50	....		31	44	....		12	38	12	58	15	8	....		....	
Steinwedel	33	26	..		...		....		....		....		...		....		....	
Bayah	....		26	54	....		....		..		....		....		....		....	
Zealand	....		25	44	....		....		13	52	....		...		....		....	
Cleveland	....		28	35	....		....		....		....		....		....		....	
Bunyip	....		....		29	50	8	11	16	25	...		13	31	....		8	40
Bobs	....		....		30	11	....		13	27	...		15	36	8	48	10	0
Florence	....		....		24	16	....		....		7	32	....		....		10	36
John Brown	....		...		..		....		13	18	....		....		7	36	....	
Purple Straw	....		....		..		....		....		11	16	....		....		....	
Thew	....		....		...		...		....		....		14	26	10	33	....	
Cedar	....		...		..		..		....		....		11	36	...		....	
Marshall's No. 3, Farmer's seed	....		...		..		....		.		....		...		13	24	....	
Comeback, Farmer's seed	....		...		.				...		..		....		....		8	4

Manurial Trial.

Variety.	Manure per acre.	Quirindi.		Delungra.		Palla-mallawa.		Tamworth.		Curlewis.		Narrabri.	
		bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Federation	Superphosphate, 42 lb.	42	46			32	0	10	13	9	0	11	54
„	Superphosphate, 42 lb., sulphate of potash, 14 lb.	..				33	22	13	35	9	34	12	0
„	No manure	42	6			30	44	10	45	9	52	13	36
Comeback	Superphosphate, 42 lb.	.		24	36			.		...		..	
„	No manure			24	3	.		..		...		....	
Steinwedel	Superphosphate, 42 lb.	33	16	.				.		..		....	
„	No manure	33	26			..		...		.		..	

Treatment of Seed for Bunt. Bluestone and Lime-water versus Fungusine.

Treatment.	Quirindi.		Delungra.		Tamworth.		Narrabri.	
	bus.	lb.	bus.	lb	bus.	lb	bus.	lb.
Fungusine	42	52	24	6	10	26	15	8
Bluestone and Lime-water	42	6	24	3	10	45	13	36

Tables of Percentage Yields.

VARIETIES.

The following table shows clearly the difference between the varieties. It can be seen from it at once how much a farmer's harvest may be increased or decreased by the varieties he uses. Federation has been taken as the standard of 100. The table shows that Marshall's No. 3, for instance, was capable of giving a yield of 125 bushels for every 100 of Federation.

Although this table gives an indication of the value of the different wheats, it must be studied carefully in conjunction with the table of the actual yields, as it is only a table of average value, and since some varieties, such as

Bayah, which is a fairly good yielding sort, were only tried at one or two places, error is liable to creep in through some local circumstance:—

Variety.	Per cent.	Variety.	Per cent.
Marshall's No. 3	125	Cedar	96
Purple Straw	114	Zealand	85
Thew	109	Steinwedel	79
Bobs	101	Florence	78
Federation	100	Cleveland	77
Bunyip	100	Bayah	73
John Brown	100	Warren	73
Rymer	98	Comeback	72
King's Early	97		

SELECTED SEED *versus* FARMERS' SEED.

Seed.	Per cent.	Seed.	Per cent.
Marshall's No. 3—		Comeback—	
Selected seed	100	Selected seed	100
Farmers' seed	61	Farmers' seed	88

TREATMENT OF SEED FOR BUNT.

Treatment.	Per cent.
Bluestone and lime-water	100
Fungusine	102

MANURIAL EXPERIMENTS.

Manure.	Per cent.
No manure	100·0
Superphosphate, 42 lb. per acre	99·3
" 42 " " Sulphate of potash, 14 lb. per acre	100·8

Details of Plots.

Quirindi.—James Marshall, Esq., Wallabadah Road.—Soil, chiefly light loam; ploughed once early in January, and surface kept loose and free from weed with spring-tooth cultivator and harrows until seeding; sown with drill on 1st May; quantity of seed, 45 lb. per acre; crop fed-off in June, and then harrowed. Harvested 29th November.

Delungra.—W. Tonkin, Esq., Garfield, Bingara Road.—Soil, black loam; ploughed deeply about the end of January; this soil remains loose on the surface naturally after ploughing, and requires little surface cultivation; reploughed just before seeding; 45 lb. of seed per acre were sown with the drill on 5th May. Early wheats harvested 20th November; late wheats 4th December.

Pallamallawa.—A. J. Blunt, Esq., Emu Park.—Soil, light red loam; ploughed once only, early in January, and surface kept loose and free from weeds until seeding, by means of harrows and disc harrows; 45 lb. of seed per acre were sown with the drill on 3rd May; in the middle of June the crop was fed-off. Harvested 20th October.

Tamworth.—Seth Forge, Esq., Oxley.—Soil, clay loam; ploughed partly in December and partly in January; portion of the paddock was cultivated once at the end of January, after rain; the land was all ploughed immediately before seeding; 45 lb. of seed were sown with the drill on 19th April; the wheat was harrowed in July. Harvested 4th December. Where light cultivation was given in January, the crop was at least twice as good as that on untreated land.

Barraba.—Edward Currell, Esq., Long Arm Road.—Soil, clay loam; ploughed once in January; worked with disc cultivator and harrows; one bushel of seed was sown broadcast and covered with disc cultivator on 15th May. The early wheats were harvested on 24th November; the late wheats on 6th December.

Curlewis.—F. J. Young, Esq., Carara.—Soil, clay loam; ploughed in February, and again just before seeding; 45 lb. of seed were sown with the drill on 27th May. Harvested 1st December.

Boggabri.—R. A. Studd, Esq., Glenaire.—Soil, light clay loam; ploughed in November, 1910; fallow worked up till seeding time by means of disc cultivator; 45 lb. seed were sown with the drill on 8th and 9th May. Harvested 13th and 20th November.

Wee Waa.—George Smith, Esq.—Soil, light clay loam; ploughed twice in February, and again immediately before sowing; it was stirred once between the ploughings with a spring-tooth cultivator; the seeding was done at the rate of 1 bushel per acre with a broadcast attachment to the spring-tooth cultivator. Harvested 8th, 9th, and 11th November.

Narrabri.—W. Palmer, Esq.—Soil, sandy; ploughed in December and January, and kept well worked on the surface until seeding, when it was again ploughed; 40 lb. of seed were sown per acre with the seed drill; the wheat was fed-off in July. Harvested 6th November.

Details of the Varieties.

Federation.—Still maintaining its position as a high-yielding variety. It has the disadvantage of bleaching rather readily in the North-west.

Marshall's No. 3.—This and Rymer are probably the best all-round wheats for the district. Marshall's No. 3 yields well, and is also a good hay wheat.

Rymer has done very well in the past season, and is evidently a good drought-resisting wheat. The grain appears to fill better than Marshall's No. 3.

Comeback.—An excellent milling wheat, and to be commended on that account. In dry seasons it does not yield heavily. It is, however, a very suitable variety for late planting, as it matures quickly.

Warren.—This variety promises very well. It evidently stands drought well.

King's Early.—This wheat yields well, and is very early, but cannot be recommended, as the heads are bearded.

Steinwedel.—This variety grows well, but should not be planted in large areas, as it shells badly.

Bayah.—This variety resembles Federation very much, and does not appear to be superior to that variety in any way.

Zealand.—This wheat is not suitable for the North-west on account of its weak straw.

Cleveland has proved itself a splendid all-round wheat for the Delungra and Inverell districts..

Bunyip is an excellent wheat for late sowing. If sown early, or even in mid-season, it will, unless carefully fed-off, come into ear too soon, and be in danger of being frosted.

Bobs.—During the past season this variety did fairly well, but it is apparently too slow a grower for the climate of the North-west.

Florence is a splendid wheat for late sowing, as it matures quickly and yields well. It shells easily, and should not be sown in large areas.

John Brown has proved a very satisfactory sort. It is a good hay wheat.

Thew.—This is also a good variety for late sowing. It is a fine wheat for sowing in oaty paddocks for hay, as it ripens early and can be cut before the oats seed. It is weak in the straw, and is very liable to lodge on strong land.

Cedar.—At the one place where this variety was tried, it did very well, although it was handicapped by being partly sown on unfallowed land, while other varieties had the advantage of fallowing.

Experiments with Wheat and Oats for Hay.

Variety.	Manure.	Inverell.			Tenterfield.			Uralla.		
		tons	cwt.	qr.	tons	cwt	qr.	tons	cwt.	qr.
Wheat—										
Comeback	No manure	2	10	1						
Firbank	,,	2	4	2						
Zealand	,,	2	2	3						
Marshall's No. 3	,,	1	17	3						
Thew	,,	2	5	0						
Bobs	,,	1	15	2						
Warren	Superphosphate, 56 lb.; sulphate of potash, 28 lb. per acre.				0	15	1			
John Brown	,, ,,				0	17	3	0	9	1
Bobs	,, ,,				0	19	0			
Thew	,, ,,				0	19	3			
Cleveland	,, ,,				0	18	2	0	8	0
Comeback	,, ,,							0	8	2
Jonathan	,, ,,							0	7	2
Haynes' Blue-stem	,, ,,							0	8	2
Budd's Early	,, ,,							0	9	2
Cleveland	No manure				0	16	0			
Comeback	,,							0	6	3
Oats—										
Algerian	Superphosphate, 56 lb.; sulphate of potash, 28 lb. per acre.				1	6	0	0	14	3
Bathurst Early	,, ,,				1	3	1	0	13	3
White Tartarian	,, ,,				1	1	2	0	11	2
Abundance	,, ,,							0	12	1
White Hopetoun	,, ,,							0	13	3
Algerian	No manure				1	3	1	0	14	1
Do.	Superphosphate, 56 lb. per acre.				1	1	2			

Details of Hay Experiment Plots.

Uralla.—Laban Rixon, Esq., Greenhills.—The soil here was a light red loam that has been cropped for many years. It was in a good state of cultivation, having been ploughed early and well worked. Good rains fell in the early part of the year before the crop was sown, but during the growing season very little rain fell. The seed was sown with the drill on 30th May, and harvested on 8th December. The failure of the crops to respond, to any marked extent, to the application of manure was probably due to the very dry season.

Tenterfield.—H. H. Willgoose, Esq., Bungulla.—The soil was a light grey granitic loam. It was ploughed once and well worked with the harrows. The seed was sown with the drill on 23rd May, and the crops were cut on 16th November. The season here was also very dry.

Inverell.—Kook Brothers, Rock Mount.—The soil was a friable, rich black loam. It was ploughed early, and was in splendid condition for sowing, which was done on 30th May. Harvested on 8th November.

WESTERN DISTRICT.

M. H. REYNOLDS, Inspector of Agriculture.*

THE 1911 Western wheat plots were located at thirteen different places, and ranged in area from 5 to 22 acres, totalling 112 acres. At each place six wheats recommended for cultivation by the Department and varieties of wheat favoured by farmers were tested. In addition to (1) the variety trial, experiments were conducted as follows:—(2) A manurial test; (3) a test with two types of drills—(*a*) a drill sowing the seed and manure through the same tubes at the one depth, and (*b*) sowing the seed and manure through separate tubes, the manure being placed deeper than the seed; (4) early, mid-season, and late sowings of certain varieties; (5) treatment of the seed with (*a*) bluestone and lime, and (*b*) Fungusine, to ascertain which fungicide was the most efficacious as a preventive of bunt, and showed the least effect on the vitality of the plant and ultimate yield.

Location of the Plots.

Nine experiments were located on fallowed land, three of which were not previously cropped by wheat, being in pasture; and four were on land cropped with wheat the previous season. The scope of the experiments did not permit of tests side by side of wheat grown on fallowed land and stubble land. The fallowed sections yielded the best, and each cultivation judiciously given apparently benefited the ultimate yield.

It was not possible to arrange for land that had been cropped previously with a soiling crop, such as rape or cowpeas. This drawback is due to want of fixity of tenure, and the necessity to fit in with the cropping of the farmer. This coming season at Gulgong, wheat will be sown in land which was sown with fodder crops, rape, barley, vetches, and peas, in the early autumn last year, fed-off by sheep until the spring, then ploughed and fallowed for the 1912 season's cropping with wheat. The rotation is wheat, 1910; rape, &c., and fallow, 1911, until early autumn 1912; then wheat again. This rotation demonstrated on the Experiment Farms will thus be brought home to the farmers.

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* Now Manager of Cowra Experiment Farm.

The value of having the plots situated adjoining a main road has been fully proved. By thus locating the plots everybody using the road is enabled to quickly note the relative growth, &c., of the different varieties.

The 1911 Wheat Season.

The weather conditions for April seeding were on the dry side. Sowing in fallow land was somewhat risky, but only slight losses of seed by malting resulted. The wheat in such land came up somewhat unevenly. On land cropped the previous season the seed-bed was generally too dry to cause malting, and in some instances the seed did not germinate until the first rains, five weeks after sowing.

Where the seed lay in the ground some weeks before germinating, the stimulating effects of superphosphate on the young plant were not so apparent, and the wheat did not obtain a lead enabling it to choke down black oats, &c.

At Maryvale it was found necessary, late in May, to plough up the early sown April plots of wheat, due to the abundance of black oats, these plots being resown the first week in June The land where these plots were situated at Maryvale was very thoroughly and systematically cultivated from the spring of 1910 until the sowing of the seed in April, 1911, and prior to 1910 black oats were not very prevalent in the paddock. This instance is mentioned to emphasise how difficult it is to exterminate black oats in one season when the rainfall has been light and unfavourable in distribution, &c.

At Parkes a like trouble affected the early sown wheats, but an extra cultivation of the section for the late sown variety, after the good rains of May had caused black oats to germinate, resulted in comparatively clean crops.

In early spring the rainfall was very short of requirements for crops, but at Forbes and Bogan Gate the crops matured satisfactorily on very light spring rains. The total rainfall for these two places from April to the end of October ranged between 5 and 6 inches.

The general rains of early November damaged, by bleaching and otherwise, the crops in the dry, warm zone, but benefited all the tableland crops from Orange and Bathurst to Mudgee as well as the crops at Young. The heavy rains of late November caused lodging at most places. My conclusion is that three-fourths of the wheat in the western dry and hot sections was more or less bleached, and bunt was noticeable, especially in Federation.

From the time of sowing until harvest, field demonstrations and evening lectures were given at different plots, and the increasing attendance of farmers indicates appreciation of the wheat plots.

1. The Variety Trial.

Federation and *Yandilla King* generally yielded better than other varieties. Late-sown varieties, *Bunyip* and *Florence*, in a few instances, yielded well. All the varieties recommended by the Department yielded satisfactorily except *Bobs* and *Comeback*. The soft-class varieties, selected by farmers for trial, did not, in most cases, equal the yield of the recommended varieties.

In the warm and dry sections—Bogan Gate, Maryvale, and Mungeribar—*Cleveland* wheat was not found suitable, and at Trundle *Zealand* was also unsuited, both varieties maturing too late.

DISEASES IN THE WHEATS.

With the exception of "rust" on early sown Federation at Mungeribar, and "take-all" at Cumnock, the wheats were fairly free from disease.

QUANTITY OF SEED SOWN.

The early sown wheats gave a satisfactory covering with 40 or 46 lb. seed to the acre, but the late sown and early maturing varieties, Bunyip, Comeback, Florence, Firbank, and King's Early, would have been better sown at the rate of 60 lb. seed per acre (especially Firbank), as these varieties do not stool well. The wheats withstood the stormy weather about harvest time fairly satisfactorily, the best being Federation and Yandilla King. King's Early and Firbank suffered most by lodging.

HARVESTING THE WHEATS.

The wheats, except Cedar, were satisfactorily harvested with the stripper harvester.

2. The Manurial Trial.

The application of superphosphate, at the rate of 56 lb. to the acre, proved the most advantageous, and plots so treated, in most instances, gave greater yields than those given a mixture of superphosphate 42 lb. and sulphate of potash 14 lb., and plots where no manure was applied.

3. Test of Drills.

The plot of Rymer wheat, sown with a drill with a Duplex seeding and manure attachment, produced more wheat than the Rymer wheat plot sown with a drill dropping seed and manure through the one tube.

These plots were not, however, comparable, as the first mentioned had the manure applied at the same time as the grain, whereas the latter had the seed sown two months after the manure was applied. This was not done purposely, but was due to a section of the land which was manured being ploughed up and resown with grain, without manure, this being necessary to destroy black oats. On comparative sections of the farm the two methods were tested and showed in favour of the Duplex feeder by 1 bushel to the acre. It was noticeable throughout the growing period that the section sown with the Duplex drill showed better stooling.

4. Time of Seeding.

It was found possible to make sowings early to late according to the time of sowing most suited to the variety. In this way varieties were shown to advantage. At Mungeribar, Bayah sown 22nd May yielded 1½ bushels more wheat to the acre than the plot sown on 5th April. Federation yielded about the same sown on the same two days.

5. Method of Treating Seed for Bunt.

No advantage in yield could be attributed to either the bluestone and lime or the Fungusine treatment.

Result of Farmers' Wheat Experiments, Western Division, 1911.

Variety Trial.

Variety.	J. G. Roach, Gilgandra.		W. Scott, Bogan Gate.		A. J. Raymond, Forbes.		Mrs. D. McMaster, Craboon.		A. Croft, Gulgong.		J. Clarke, Dapper, Gulgong.		T. Bragg, Mungeribar.		Major Barton, Maryvale.		W. Iram Nash, Parkes.		W. Kearnen, Cumnock.		J. Skinner, Trundle.		W. Trudgen, Grenfell.		H. E. Barrett, Young.		Number of Trials.	Average Yield.	
	bus.	lb.	bus	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus	lb.	bus.	lb.	bus.	lb	bus.	lb.	bus.	lb.		bus.	lb.
Farmer's Variety	21	22	..		10	58	.		19	55	.		17	40	19	53	11	55	9	11	.		....		20	32	8	16	25
Comeback	21	18	..		11	45	14	27	.		..		...		17	25	...		6	24	9	56	...		19	0	7	14	19
Bunyip	19	24	12	52	16	22	..		...		10	20	22	42	22	37	19	22			13	46	16	20	...		9	17	5
Florence	18	54	11	45	16	30	...		20	24	.		19	12	17	15	14	54	..		....		13	38	15	0	9	16	23
Firbank	18	50	..		..		.		.		.		....		...		14	46	6	21	.		....		..		3	13	19
Rymer	21	28	13	58			20	32	..		15	6	22	47	21	48	14	51	12	14	13	55	....		21	41	10	17	50
Bobs	18	8	13	0	11	31	..		19	40	12	50	16	34	19	48	....		12	24	...		15	18	...		9	16	28
Marshall's No. 3	21	22	.				19	0	...		..		..		24	45	...		16	15	....		17	14	....		5	19	43
Federation	24	10	14	15	15	54	24	15	27	32	8	10	21	39	25	24	...		16	44	13	20	17	18	22	27	12	19	0
Cleveland	....		12	44	..		17	0	25	29	...		..		18	49	...		12	12	...		...		18	17	6	17	25
Bayah	.				12	44	..		.		12	6	20	42	18	26	10	35	....		..		17	55	18	56	7	15	55
Zealand			.		.		....		.						21	38	...		...		11	0	..		...		2	16	19
Cedar			..										.		16	3	.		....		....		...		16	12	2	16	7
Genoa							22	13	19	40	11	16			.		..		.		...		..		.....		3	17	43

Manurial Trial.

	J. G. Roach, Gilgandra.		W. Scott, Bogan Gate.		A. J. Raymond, Forbes.		Mrs. D. McMaster, Craboon.		A. Croft, Gulgong.		J. Clarke, Dapper, Gulgong.		T. Bragg, Mungeribar.		Major Barton, Maryvale.		W. Iram Nash, Parkes.		W. Kearnen, Cumnock.		J. Skinner, Trundle.		W. Trudgen, Grenfell.		H. E. Barrett, Young.		Number of Trials.	Average Yield.	
No manure	20	30	12	17	13	14	11	40	19	4	8	50	15	49	27	8	9	39	6	55	9	7	12	43	16	9	13	14	5
Superphosphate, 56 lb. ..	21	28	14	15	15	54	17	0	19	40	12	6	20	42	27	26	10	35	16	44	9	33	17	55	22	27	13	17	22
Superphosphate, 42 lb.; and sulphate of potash, 14 lb.	20	54	14	38	16	12	15	47	22	46	12	10	19	20	27	24	9	51	11	51	13	56	15	42	19	36	13	17	0

Fungicide Trial.

	J. G. Roach, Gilgandra.		W. Scott, Bogan Gate.		A. J. Raymond, Forbes.		Mrs. D. McMaster, Craboon.		A. Croft, Gulgong.		J. Clarke, Dapper, Gulgong.		T. Bragg, Mungeribar.		Major Barton, Maryvale.		W. Iram Nash, Parkes.		W. Kearnen, Cumnock.		J. Skinner, Trundle.		W. Trudgen, Grenfell.		H. E. Barrett, Young.		Number of Trials.	Average Yield.	
Fungusine	..		11	54	..		....		..		...		22	8	26	52	....		..		..		....		....		3	20	18
Bluestone and lime-water ..	..		14	15	...		..		..		....		21	39	25	24	...		....		..		...		....		3	20	26

SOUTH COAST DISTRICT.

R. N. MAKIN, Inspector of Agriculture.

THE wheat plots on the South Coast during the past season were favoured with better conditions than on any other occasion since the experiments were introduced. Although a good start in sowing was followed by a dry spell, which retarded growth during June, the crops made good headway when running into ear. In most cases the harrow was used to advantage on the young crops during June, which went a long way towards conserving the moisture.

The first plot was sown at Pambula on 22nd April, 1911, and the success of this plot is attributed to the fact of its being in early enough to catch the seasonable rains. The average obtained of 6 tons per acre for seven plots was very fair. Plots sown later did not give a good return for winter fodder.

March and April will be found the best months for sowing; and if the land has been summer fallowed, so much the better. Dairy farmers on the South Coast do not give enough attention to this matter.

Of the varieties of wheat sown, *Thew* still holds its place as a quick-growing, rust-resisting wheat. Six plots, in different parts of the South Coast, gave a return of 6 tons 10 cwt. per acre of greenstuff. The return should have been higher, but Thew matures much ahead of other wheats, and I found on my arrival at several plots that the crop of this variety was on the dry side, whilst other varieties were hardly fit to cut. At Dapto, this wheat was nearly a month ahead of other varieties, and gave a return of 2 tons 1 cwt. over and above the next best variety.

In comparison with Algerian oats—a crop grown largely for green feed by South Coast farmers—Thew wheat stands out well in regard to early maturity. At Dapto it came into ear in 108 days, whilst on our oat plot, not a mile away, the Algerian variety took 184 days to come into ear. In point of yield there is little difference between the average yield of the Thew wheat plots and a similar area of Algerian oats. Farmers in the Dapto district are planting this variety of wheat extensively this season for green fodder. The Dapto A. and H. Association, a body very active in fostering the farming interests in the district, ordered 100 bushels of seed for the members. A test such as this will be of value in proving the adaptability of the variety.

Next to Thew, *Warren* wheat showed up well. It carries more flag than Thew, but does not appear to be so rust-resistant.

Huguenot grew very well in some cases, particularly at Unanderra, where it was about 6 feet 7 inches high. It was a bit on the dry side when cut; otherwise a greater return would have been recorded. It and *Medeah* are both good fodder wheats, sweeter than other varieties, highly rust-resistant but slower growing.

John Brown wheat grew very evenly on all plots. It showed rust in some cases, although not very badly. It is a bit slow in growing, but runs up quickly when it starts. It is a very useful hay wheat, but I do not recommend it for fodder in comparison with other varieties. A manurial trial was conducted with this variety, and the best results, after averaging four experiments, show that 56 lb. superphosphate per acre is sufficient manure for the crop. However, more manurial experiments may be looked for in the coming season, which will probably be of much interest.

RESULTS OF SOUTH COAST WHEAT EXPERIMENTS, 1911.

Experimenter	Thew.	Warren.	Huguenot.	Medeah.	Bobs.	John Brown.	Manure Trial with John Brown Wheat.		
							Un-manured.	Superphosphate, 1 cwt.; Potash, 14 lb. per acre.	Superphosphate, 56 lb. per acre.
	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.
W. Harris, Dapto	7 15 0	5 14 1	4 17 0	3 11 1	. .	5 7 3	3 12 3	3 10 0	4 4 1
W. T. Stiles, Bega .. .	5 12 1	4 3 3	6 3 3	7 12 1	..	3 6 2	2 17 0	5 3 1	3 12 1
L. Carr, Unanderra .	4 5 2	5 0 0	8 2 3	..	...	5 13 1	5 19 1	6 11 1	7 12 3
J. H. Martin, Pambula ..	7 2 3	5 14 1	...	7 8 2	. .	5 14 1	4 5 2	5 8 2	6 8 2
J. Chittick, Kangaroo Valley.	7 16 1	6 12 2	....	....	.	7 0 2	....	....	....
J. Dobs, Moss Vale.. ..	. .	....	....	.. .	5 4 2	5 9 2	....	....	....
Sir Wm. McMillan, Albion Park.	.. .	....	....	....	6 5 2	5 3 0	....	....	....
Average	6 10 1	5 10 3	6 7 2	6 4 0	5 15 0	5 7 3	4 3 2	5 3 1	5 9 1

TRIAL OF ENGLISH SPRING WHEATS AT JINDABYNE WEST.

IN addition to the trials of these wheats at the Experiment Farms, as reported in last issue, tests were also made on Jindabyne West Estate, it being thought that they might suit the climate of that district. Mr. H. Ross, Inspector of Agriculture, reports :—

> The following varieties of imported wheats were sown at Jindabyne West Estate on 2nd and 3rd August, 1911 :—Earliest of All, Red Marvel, Perfection, Sensation, Dreadnought, Red Admiral, and Improved Red Fife. For comparative purposes, Haynes' Blue-stem, Cleveland, and Cedar were also sown.
>
> For some unaccountable reason, Earliest of All did not germinate, not a single grain of this variety coming up.
>
> Perfection was so badly attacked by frost that it was entirely destroyed.
>
> The other imported varieties were all more or less affected by frost, whereas our own varieties, especially Haynes' Blue-stem and Cleveland, showed no ill effects from frost.
>
> In the Jindabyne district, wheat cannot be grown profitably for grain, and what is really required is a good hay wheat which is fairly frost-resistant. In this respect, Cleveland and Haynes' Blue-stem were much superior to the imported varieties. These two can be recommended for hay, and if grain is wanted, Cleveland.

Of course, as the English seed was imported, the trial can hardly be considered as comparative. In all cases, the experience of this Department shows that imported wheats require at least one year to become acclimatised before comparison can be made with local varieties. Arrangements are being made to give the wheats a further trial during the coming season.

SUMMER GRASS SILAGE.

IN 1909 the Butts paddock at the Hawkesbury Agricultural College was planted with sorghum. From one cause and another, it received only scanty cultivation. Summer grass, which in a moist season is the commonest weed here, gained the upper hand, and grew equally with, if not better than, the sorghum.

When ready to harvest, about February, 1910, there was as much summer grass as sorghum, and to minimise any waste of material, it was decided to place it as a foundation for a silage stack of maize. The maize harvester was used in cutting the crop, and every sheaf of stalks had a large bundle of summer grass attached around the base. The Town paddock, which also had a thick coating of summer grass, was mown at the same time, and the loose green material carted to the stack.

Altogether about 100 tons of this mixture were utilised, and stacked indiscriminately at the base, while the upper portion was composed entirely of maize, making a total weight of about 500 tons.

The maize has all been utilised, and for some time past the mixture of summer grass and sorghum has formed the bulk of the feed of the dairy stock. It is a little dry now, but that it is undoubtedly an excellent sample of silage is the verdict of all who see it. This is corroborated by the fact that the stock relish it equally with the best silage produced here.

Forty pounds of silage, 10 lb. of lucerne and oaten chaff mixed, and 3 lb. of bran, form the daily ration for the milkers at the College. This ration has kept the stock in excellent condition, and they have shown no diminution in their milk yield.—J. W. HADFIELD, Instructor in Agriculture.

RHODES GRASS *v.* PASPALUM.

MR. C. R. STAPLES, Ocean Beach, Woy Woy, has been trying various grasses upon the poor sandy soil of that district, and has supplied the following notes respecting these grasses under such conditions :—

Paspalum is the stronger grower, and can be stocked the first year. Once it gets hold stock cannot pull it up. It gives a green bite, although making no great growth, all through the winter. Although it does not "run" like Rhodes grass, it seeds so freely that it spreads rapidly.

Rhodes grass is the softer and sweeter grass, and is preferred to Paspalum by stock; and I should say it is the better fattening grass. It should not be stocked but mown for the first two seasons. If stock are put on it the first season they will pull up the runners (sometimes 5 or 6 feet long), leaving bare patches. It entirely disappears with the first frost, and lies dormant all through the winter. It is not a poor man's grass, as to get the best results it must not be stocked for two years. Its giving no feed all through the winter is also a disadvantage.

On the whole, my experience is that for general purposes Paspalum is the better and more reliable grass to plant.

Trifolium subterraneum gives a great amount of feed for six weeks or two months in the spring. After that it disappears. My patch has been sown now three years, and I have come to the conclusion that although it will carry a very large number of stock for a short time in the spring, it is not a good all-round food plant, and nothing like what it is represented to be by some enthusiasts

A Blue Couch Grass (*Cynodon incompletus*, Nees) which is Sometimes Poisonous.

J. H. MAIDEN,
Government Botanist, and Director of the Botanic Gardens, Sydney.

DR. J. M. PETRIE, Macleay Fellow of the Linnean Society of New South Wales, has recently discovered hydrocyanic (prussic) acid in this grass from the Botanic Gardens, Sydney. The grass grew from plants brought by me from Aberdeen, Upper Hunter, N.S.W., in 1907, from a spot on which cattle had died at the time, and the cause of death had not been satisfactorily ascertained.

Strange to say, no deaths of stock have occurred (or at least been reported) on the Upper Hunter, from a similar cause, from that day to this.

In December, 1911, a number of travelling sheep were poisoned while crossing Forbes Common, and Dr. Petrie found hydrocyanic acid in this grass only, although he examined others on the Common.

So that a poisonous substance has been found in December, 1911:—

(*a*) In grass cultivated in Sydney, taken from an area in which cattle were poisoned at Aberdeen late in November, 1907.

(*b*) In naturally-growing grass at Forbes from an area in which sheep were poisoned early in December, 1911.

It will, of course, be inquired into, in due course, whether at this particular time of the year the grass is more poisonous than at any other.

The following is a description of this grass:—

C. incompletus (Nees in *Linnæa*, vii, 301); culms slender, 2–7 in. long, 2–3 noded, glabrous, smooth; sheaths glabrous or hairy to villous, bearded at the mouth, the lower loose; ligules membranous, truncate, up to ⅓ lin. long; blades linear, very shortly acute or subobtuse, 1–2 in. by 1–1½ lin., rather flaccid, glaucous, rough on both sides, glabrous or hairy to villous; spikes 3–5, straight, ¾–1¼ lin. long; spikelets, 1¼–1½ lin. long; rhachilla not produced; glumes ovate to lanceolate, acute, the lower ¼–⅔ lin. long, the upper ⅓–¾ lin. long; valve 1¼–1⅓ lin. long, keel narrowly or obscurely winged, rigidly ciliolate, keels of the pale stout, very close, scabrid above; anthers rather more than ½ lin. long; otherwise like the preceding species (*C. Dactylon*). (*Flora Capensis*, vii, 635.)

I originally determined this grass as the common Couch (*Cynodon Dactylon*, L. C. Rich), and when it was suspected of poisoning stock the matter remained a mystery, for no one had ever heard of Couch grass possessing any injurious properties.

In 1911 the grass was sent to Kew, and determined by Dr. O. Stapf as *Cynodon incompletus*, Nees, a species hitherto recorded only from East Africa and South Africa. It has been found in New South Wales from localities so far apart as the Upper Hunter and Forbes, and it so resembles the common Couch in general appearance that it doubtless remains to be discovered in many other parts of Australia. Further investigations are necessary as to whether it is an introduced grass, or indigenous to Australia as well as to Africa.

Differences between Couch and Blue Couch.

Dr. Stapf, in *Flora Capensis*, gives the differences as follows:—

Culms many noded, with the leaves crowded at the base; ligule a ciliate rim; rhachilla produced	*Dactylon.*
Culms 2–3 noded; ligule membranous; rhachilla not produced ...	*incompletus.*

[For explanation, see Plate.]

Notes on the poisonous character of Blue Couch.

Hydrocyanic (prussic) acid does not appear to occur in grasses in all stages of growth. It is formed by a kind of fermentation, and later on it disappears. This accounts for the fact that a once poisonous grass patch is not always poisonous.

Then again, hydrocyanic acid has not been detected in most grasses, although likely enough it will be found in certain grasses and herbs not yet suspected. As a matter of fact, it has been already found in a few Australian plants, and experiments are going forward to see how many, and then to suggest a remedy.

If one were to advise that paddocks containing Blue Couch should be kept free from stock, we must remember that there have been no fatalities at Aberdeen for four years, and cattle have not been excluded from these paddocks.

It may be that stock-owners will have to spell Blue Couch paddocks for a period, until the chemist pronounces the grass to have got harmless again.

In the meantime, the object of this note is to help stock-owners to identify this grass, and perhaps to contribute additions to the meagre information we at present possess concerning it.

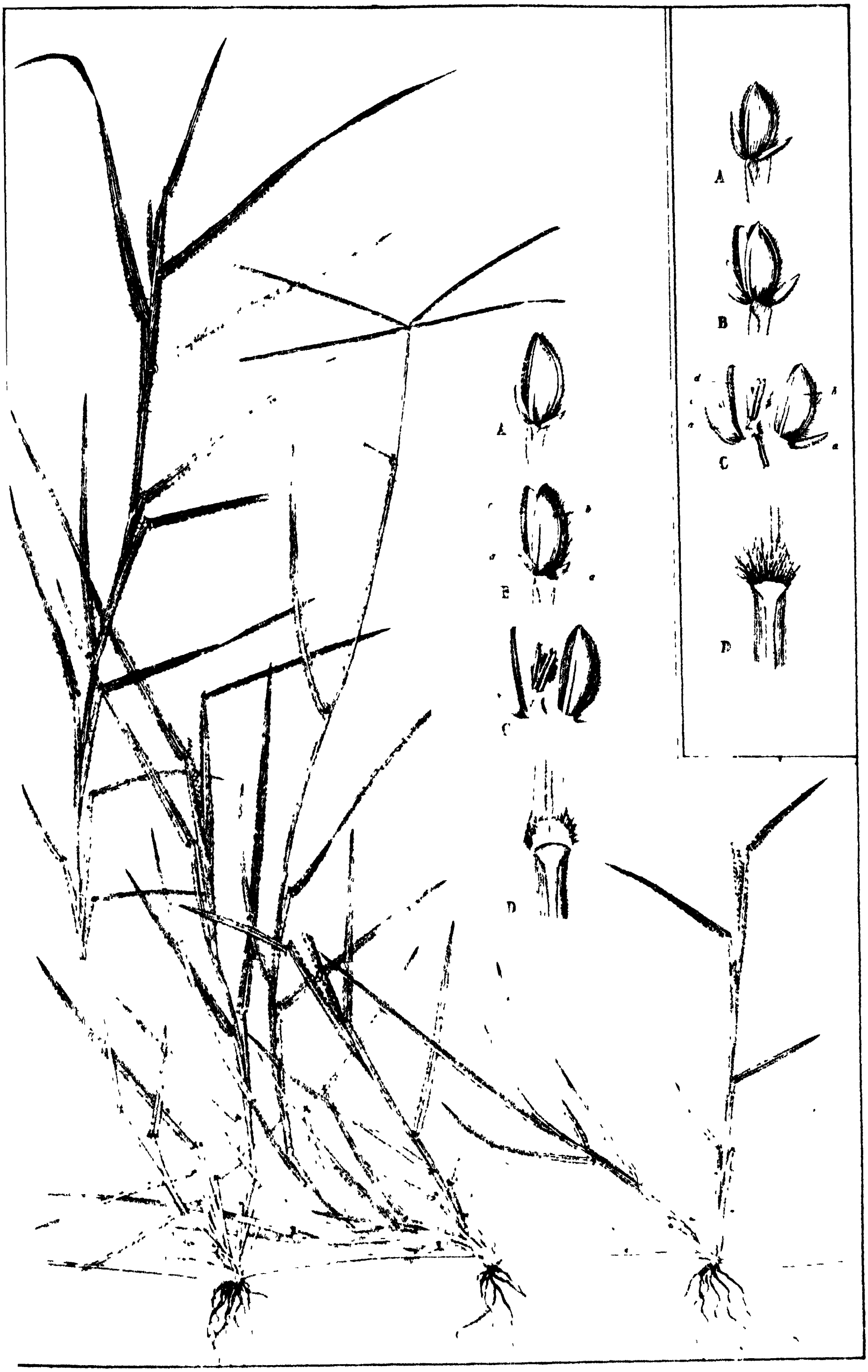
EXPLANATION OF PLATE.

Cynodon incompletus, Nees (main portion of Plate).

A. Flower (rather more than one line long).
B. Flower opening, showing—
    aa. Outer glumes.
    b. Inner glume
    c. Flowering glume.
C. The parts of the flower.
D. Ligule, membranous, with cilia on each side.

Cynodon Dactylon, L. C. Rich (inset).

A. Flower (rather less than one line long).
B. Flower opening, showing—
    aa. Outer glumes.
    b. Inner glume.
    c. Rhachilla.
    d. Flowering glume.
C. The parts of the flower.
D. Ligule, ciliate.



Cynodon incompletus, **Nees.**
(*C. Dactylon*, L., C. Rich. in inset).

Hides and Sheepskins.

E. J. SHELTON,
Pig and Bacon Expert,* Hawkesbury Agricultural College.

THE demand for hides and sheepskins is now so great that buyers from all parts of the world compete eagerly for all good lines, and some very high prices are realised. We would therefore impress upon readers the necessity of observing the recognised methods of preparing their consignments of produce for market. When these rules are followed the selling agents are enabled to place commodities before buyers under the most favourable conditions, the result invariably being a good recompense for any little extra care bestowed. At present, most of the selling agents complain that the consignments are usually badly "got up."

HIDES.

Taking into consideration that we have in this State at all times a good market for heavy, well-prepared hides, and a rather poor demand for those not properly "got up," it is manifestly to the sellers' advantage to improve general methods. A visit to the sale-rooms will convince any one of this. That the better conditioned hides are appreciated by the tanners is seen in the increased price paid for anything good.

Names of Hides and Skins for Tanning Purposes.

When a calf is born prematurely, or is skinned whilst very young, the skin is called a "bobby."

A skin from	7	to	16	lb.	is called a	calfskin.	
„	16	„	30	„	„	kip.	
„	30	„	40	„	„	light leather.	
„	40	„	70	„	„	medium	„
„	70	„	100	„	„	heavy	„

The skin from a sheep (with wool removed) is called a "pelt."

Weight of Hides.

Calf	about	60 lb.	live weight	will give about	7 to 8 lb. skin.
Vealer	„	100 „	„	„	14 „ 16 „ „
Yearling	„	200 „	„	„	20 „ 25 „ hide.
2-year-old	„	350 to 400 lb.	„	„	32 „ 38 „ „
4 „	„	600 lb.	„	„	50 „ 60 „ „
6 „	„	1,000 „	„	„	60 lb. upwards hide.

From the gross weights, an allowance of 4 per cent. tare is deducted when the purchases are being invoiced to the buyers.

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* Also in charge of the Butchering Department.

Classification for Market.

In marketing, hides should be classified as follows:—

Butchers' hides,	Yearling hides,
Ordinary butchers' and farm hides,	Horse hides,
Bull hides,	Calfskins.

These may, for sale, be still further classified as under:—

- Extra stout—60 lb. and upwards in weight.
  - Heavy weights, picked lots.
  - ,, ,, good condition.
  - Ordinary.
- Medium weights—50 lb. to 60 lb. in weight.
  - Good condition.
  - Fair ,,
- Light to medium weights—40 lb. to 50 lb. in weight.
  - Good condition.
  - Fair ,,
- Light weights—32 lb. to 40 lb. in weight.
  - Good condition.
  - Ordinary condition.
- Inferior and faulty—
  - Dry hides.
  - Bests.
  - Seconds.

Prices.

Prices for any of above vary from 4d. to 8d. per lb.

Bull hides realise from 4d. to 6d. per lb.

Yearling hides, distinguished by weighing less than light weight (good) hides, realise:—

	s.	d.		s.	d.	
Large	12	0	to	17	0	each.
Medium	8	0	,,	10	6	,,
Small	5	6	,,	7	0	,,
Cut and faulty	1	0	,,	10	0	,,

Calfskins weigh less than yearlings, and are smaller and softer, generally realising:—

	s.	d.		s.	d.	
Large	4	6	to	6	0	each.
Medium	2	6	,,	4	0	,,
Small	1	6	,,	2	6	,,
Cut and faulty	0	6	,,	2	0	,,

Horse hides realise—

	s.	d.		s.	d.	
Large	12	6	to	17	0	each.
Medium	10	0	,,	12	6	,,
Small	2	6	,,	9	0	,,

Whilst the market necessarily fluctuates, there are rarely any very sharp declines or appreciations in values, lack of Continental orders and a rush of hides into the market being usually the cause of any decline.

Defects.

Amongst the various causes accounting for the reduction in price of some hides over others may be mentioned:—

1. *Bad flaying or skinning.*—The importance of good flaying cannot be too strongly emphasised. Hides free from cuts or "scores" are worth ½d.

to 1d. per lb. more—equal in the case of average weight hides to 3s. or 4s. more per hide—as compared with those severely cut or scored. Scores are particularly objectionable. A "score" is a cut in the hide sufficiently deep to injure the grain of the leather, though not deep enough to be classified as a cut, which is the hole caused by a knife, a rip from a horn, &c. Cuts in the hide have to be cut out before tanning, thus reducing the size of the piece, whilst scores show plainly in the cured and tanned product. Scores, through being filled with salt, blood, &c., during curing, are often not noticed till the leather is tanned, hence the particular objection.

Fat and flesh left on the hide also reduce its value.

Rips and bruises in the hide, often caused by bad droving, dogging, and otherwise injuring the cattle when yarding, trucking, &c., are accountable for much loss.

2. *Uncleanliness.*—This also causes a decline in value, and it is advised to wash the hide (flesh side) with warm water before salting. Blood on the hide decomposes rapidly, particularly in warm climates, and causes a "slippiness" in the hide, which is described later.

Washing the hide may seem a theoretical idea, and too much trouble, but the increased price realised for good clean hides in comparison with faulty ones will amply repay the extra labour.

Before "bibling" (described later), sweep off all surplus salt and dirt. This, if left on, only increases the freight in transit to market, and is of no value.

3. *Bad branding.*—Branding on the more valuable part of the hide—rump, hind leg, ribs, shoulder, &c.—reduces the value in comparison with those branded on the cheeks; and though there are many reasons, from the drover's standpoint, why rump-branding is the most useful, for the tanners' requirements cheek-branding is certainly the best.

4. "*Slippiness.*"—This condition spoils the hair (which, of course, is removed during the process of tanning, and forms a separate product), and makes the grain of the finished article very much weaker, and of less value. "Slippy" hides are at times unsaleable, and under this heading come hides that have been flayed whilst wet, and have not been sufficiently cared for and salted; those from cattle that have been dead for some time; those that have been killed or seriously injured (bruised, &c.) whilst in the trucks en route for market; and those from cattle that have become bogged in half dry water-holes, have died there, and have sweated in the sun for some time prior to flaying. Hides that have been stacked before the animal heat has been allowed to escape often get soft and "slippy," and a "slippy" hide in a consignment makes the buyer particularly cautious.

It is no uncommon sight to see many of the leading buyers, both local and export (the latter particularly), when valuing hides prior to the sale, pass over any lots cut or scored, dirty, or "slippy," without even putting a price on them. Hides will absorb up to 5 or 6 lb. of water, and it is not to be expected that the buyers will pay the same price for water as they will for dry hide; though some sellers believe that it is as well to let the hide carry as much moisture as is acceptable to the buyers. Perhaps it is better to strike the happy medium, where (as an American writer has it), the seller gets all he is entitled to, and the buyer is satisfied with what he obtains.

Ticks.—Mr. W. W. Froggatt, Government Entomologist, states that the only parasite that does any material damage to the hides in this country is the Queensland cattle tick (***Margaropus australis***).

The "Ox Warble Fly," incorrectly called a "Bot" (***Hypoderma bovis***, De Geer), which injures hides in England, America, and other countries, has never caused any trouble in Australia, though several of the imported cattle in quarantine have been found to be infested.

The illustrations show:—

Fig. 1.—"Ticky" harness leather.
Fig. 2.—First-class harness leather, not "ticky."
Fig. 3.—First-class bridle leather, not "ticky."
Fig. 4.—"Ticky" bridle leather.

A close examination of the pictures will show the holes left after the ticks. When several tick-holes are in a line, quite a distinct split in the leather is noticed.

It is generally recognised that a large number of the hides coming to the Sydney market from Queensland are affected by ticks; and as "ticky" leather is worth considerably less (½d. to ¾d. per lb.) than leather made from hides free from this pest, the value of the raw material is lowered in the same proportions. New South Wales hides, generally speaking, are free from ticks, as are those from Victoria and South Australia; whilst from Western Australia occasional "ticky" hides are seen.

"Ticky" hides, though they may be perfectly cured and free from cuts and scores, are worth fully 4s. per hide less than those not so affected. The tick, penetrating through the hair side into the flesh, leaves a little hole which never properly fills up, even though the animal is thoroughly dipped some time before being slaughtered.

Drying.

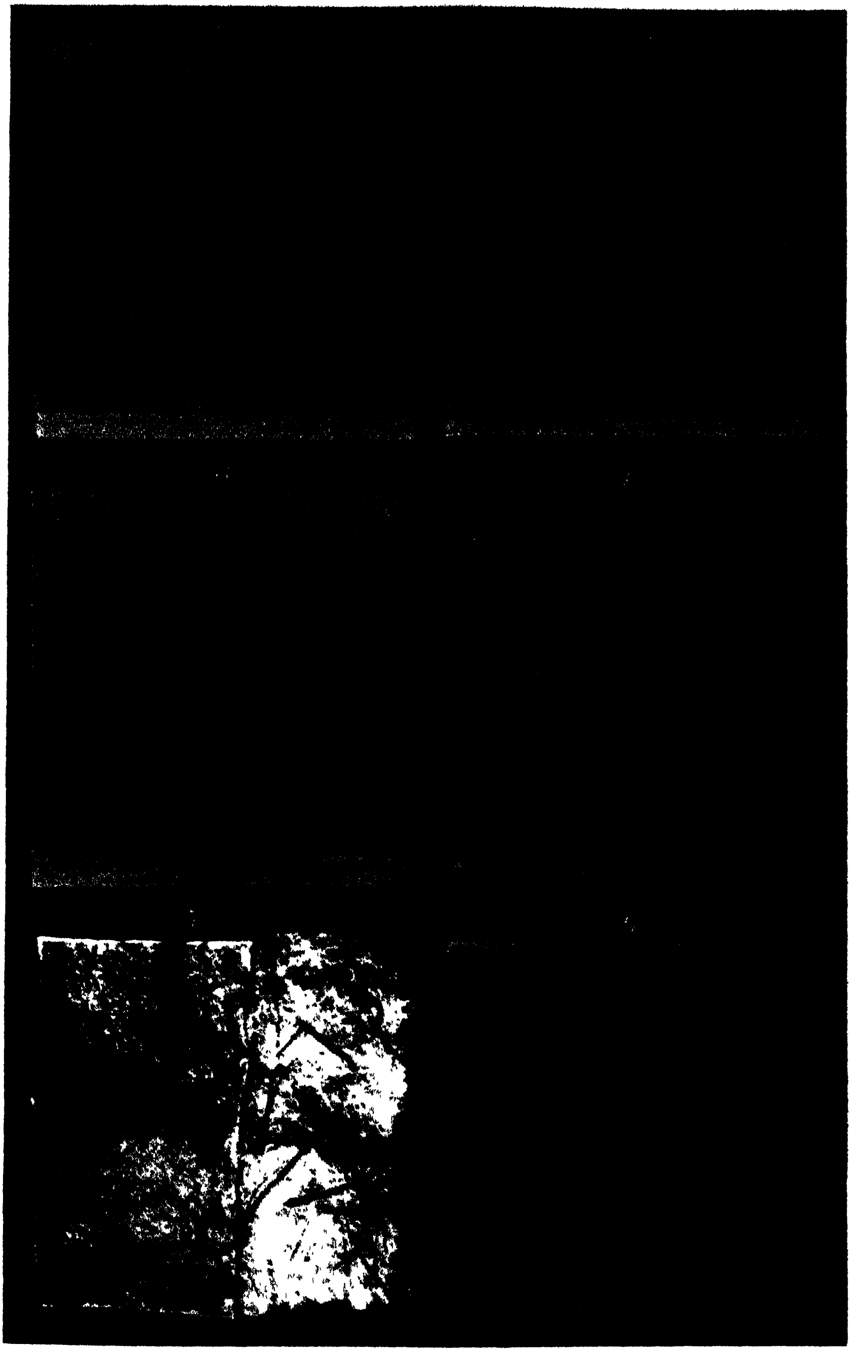
After flaying, the hide should be spread out flesh side up and allowed to cool, for if the hides go into the stack too hot they may become "slippy."

Care should be taken to lay the hide on an even surface; concrete floors are necessary where large quantities are to be stacked. Let the hide lie till the animal heat has gone, before salting. Note that hides should not be sun-dried unless they are to be sold as sun-dried hides; therefore, drying and cooling in the shade is advised.

See that the trimming has been completed before salting. Glue-pieces sell better if simply dried; if salted and cured on the hide and trimmed afterwards, the pieces are sold as offal at considerably less value.

To Trim a Hide.

Figure 7 will give an dea of the correct appearance of the hide after the trimmings (glue-pieces) have been removed; and as these do not require



Samples of Leather.

1. "Ticky" Harness Leather.
2. First class Harness Leather.
3. First class Bridle Leather.
4. "Ticky" Bridle Leather.
5. Seedy Pelt (Sheepskin).
6. First class Basil (Sheepskin).

salting it will be best to trim the hide before curing. The following are the steps in properly trimming:—

1. Forelegs to be taken off above the knees, V-shaped inwards.
2. Hindlegs at second joint or "hock," V-shaped inwards. No "pockets" (the portion of the hide covering the knee and hock) to be left.
3. Tail to be cut off within 2 inches of the body.
4. Forehead, ears, lips, udders, &c., to come off.
5. Cheeks to be rounded off.
6. All useless long pieces on any part of the hide to be cut off.
7. All flesh and fat to be removed.
8. The hide (hair side) to be swept clean, and all accumulations of dung, &c., removed.
9. Flesh side to be washed with warm water to remove blood, dirt, &c., before salting.
10. After the salting (curing) process is complete, the hide to be swept as clean as possible to remove all salt and foreign matter.

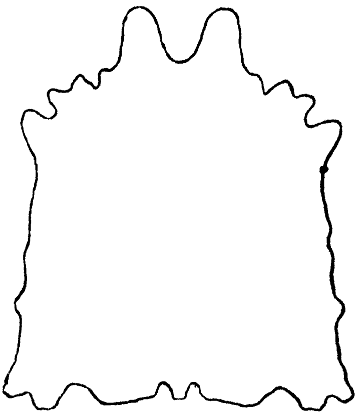


Fig. 7.—Appearance of a hide after trimmings are removed.

Bulls' hides, yearlings, calfskins and horse hides should be treated in the same manner; though calfskins and yearlings do not need severe trimming.

After trimming, the tails, ears, and other pieces must be allowed to cool and dry, not just thrown together in a stack, where heat is quickly generated and decay begins. They are marketable, and if properly saved return good values.

Curing.

Salt evenly all over, using ordinary coarse salt. There is no necessity for the salt to be very finely ground, as it is more expensive; though, on the other hand, large lumps are more or less objectionable, and may make nasty pockets in the hide during the curing process.

Special care must be exercised to see that every part of the hide is exposed to the action of the salt. All the points should be flattened out and thoroughly salted.

Perhaps the best way to cure small lots of hides is as follows:—

Place the hides on the floor; allow to cool; then salt evenly, paying particular attention to the points, sides, neck, &c. Leave for six hours to thoroughly cool; then fold each hide in halves, head to tail, and lay them on top of one another, sprinkling a little salt on the hair side next to the points and neck. By this means the flesh side does not come into contact with dirt and blood on the hair side. They should be left folded for from seven to ten days.

Where quantities are to be cured, stack one on top of the other, the hair side of the one in this case facing the flesh side of the one previously laid down. Always keep the flesh side up. It is advantageous then to keep each killing separate from the rest. A room where ten to fourteen stacks can be laid down is desirable, and in this case the hides should remain in the stack rather longer than in the case of only a few.

Where large stacks are continually being salted, it is a common practice, after sweeping the hide before rolling or "bibling," to utilise this salt a second time, using, say, one-third old and two thirds new; and where economy is desired, this procedure is advisable, as long as the salt is clean and not mixed with hair, dung, blood, &c.

A bad feature in the stacking of large quantities of hides is that a hide besmeared with blood, &c., will discolour the flesh side of the one next to it in the stack; and as previously mentioned, unclean hides do not sell well. It is necessary that the hides be kept quite clean, so that when cured they will present as bright and clean an appearance as possible.

In either of the above methods, care must be exercised in stacking to see that the outer edge of the stack (at the points of the hide particularly) be kept rather higher than the inside; for, if too low, the moisture that will drain from the stack will wash all the salt off the thicker parts of the neck, &c., and they will not cure so well. They will also shrink, and thus cause loss.

Calfskins, yearlings, and horse hides should be salted in a similar manner.

About 12 to 18 lb. of salt (according to the age of the hide), at a cost of, say, 10 lb. for 6d., is necessary for curing average hides, and it is better to use too much rather than too little.

On stations and farms where salting is not practised, the hides are dried, and sold as such; and for this purpose, instead of curing as above, they are dried in the shade, and are laid flat on the floor or ground and pegged as near to the desired shape as possible. Care must be taken to expose every part to the air, and thus prevent accumulation of blood, &c., from going putrid and thus spoiling the hide. When dried, roll in bundles—do not fold as described for salted hides.

At the completion of the salting or "curing," the hide must be taken up, swept clean, and any further trimming done as required. If wet, they should be allowed to dry somewhat before "bibling," which is the trade name for rolling or folding the hides.

To Fold a Hide.

Method No. 1.—As the hide lies flat on the ground, pass round and turn in all edges (Fig. 8). Now turn in half of each side lengthways towards the centre (Fig. 9); then place one side upon the other (Fig. 10); now fold both ends towards the middle (Fig. 11); and finally fold or roll one on top of the other, and securely tie with rope or lashing. Fig. 12 shows "bibling" completed.

Method No. 2.—Commence by folding along the lines marked A–B (Fig. 13), and then from C–D fold in exactly the same manner, but from the sides. Then fold as in Figs. 9 and 10.

Both methods have advantages, and either can be used. Attach label to each hide, with address of consignee and owner's brand or initials.

It is not advisable to consign hides packed in bags or packs, but to consign as folded in Fig. 12, each hide separately.

On arrival at the broker's store, the hides are further trimmed (if necessary), swept, and graded before being catalogued for sale, any pieces removed being credited by account sales to the owner at market values.

Calfskins, yearlings, and horse hides are consigned in bags sown up tightly and neatly branded.

It is good practice when folding or bagging, if the hides are at all wet, to sprinkle a little clean salt on the hide after sweeping old salt off; but this is only advisable in special cases.

The hide market regulations are very stringent, and everything possible must be done to ensure putting the article before the buyer in the best possible manner.

SHEEPSKINS.

These are classified according to quality and amount of wool they carry as follows:—

Full wools, super	Prices varying from 3d. to 9d. per lb.
Three-quarter to full wools, good...	
,, ,, ordinary .. .	
,, ,, heavy .. .	
Medium wools, super	
,, ordinary	
,, heavy . ..	
Short wools—	Prices varying from 1½d. to 8d., and sometimes 9d. per lb.
Pelts {good	
Pelts {ordinary	
Cross-breds, coarse to fine	
Lambs, good	
,, cross-bred	
Faulty-pelted lots	

Prices obtained for sheepskins vary considerably, as does the market for wool by which they are affected. In most cases a rise or fall in wool is followed by a fluctuation in the value of sheepskins. Their value depends upon their condition and the amount of wool they carry. It is the wool that realises the price, as, with good condition, the pelt rarely varies much in value.

When the wool is removed from the pelt (fellmongering), the pelts are put through a preserving or tanning process and come out under the name of "basil." At one time pelts were salted or pickled, and were worth up to 1s. 8d. per lb. for lining of boots, bookbinding, &c., but now that linen is used so largely in these trades the value of the pelt is reduced to much the same price as linen, and there is now little or no sale for "pickled pelt."

Defects.

The chief reasons why some skins realise less than others are briefly as follow:—

(1) The small amount of wool they carry, the value of the wool roughly being 8d. per lb., whilst pelts realise from 3d. to 6d. per lb.

(2) Being placed in a lower grade owing to being in bad condition as regards cleanliness, or through being mildewed and rotten.

(3) Through the pelt being weevil-eaten, thus allowing the wool to pull out and be separated from the rest.

(4) One decided cause of damage to the skin, and hence a cause of depreciation in value, is grass seeds, burrs, &c., which work through the pelt, the holes they leave being easily detected in the tanned basil. The illustrations will show—

Fig. 5.—A sample of seedy pelt.

Fig. 6.—A piece of good quality (pelt) basil.

The seeds of spear-grass, &c., penetrate the pelt, and as a result it is not suitable for making first-class basils, and to this extent the value is lowered. In cases where the seed penetrates almost every part of the skin, the pelt is practically useless for tanning purposes. Seeds or burrs in the wool also have a depreciating effect, the extent of the damage being regulated by the proportion of burrs and seeds present, the reason being that the manufacturers find it an extremely difficult matter to comb them out.

Though it is not within the scope of this article to say what might be done to prevent grass seed, &c., damaging the wool, doubtless owners will see the necessity of at least attempting to preserve this, one of the most valuable by-products of the farm, from depreciation wherever possible.

(5) Tar-branding.—This is detrimental to the sale of the skins, on account of the stain it leaves in the wool. Tar-branding, it would appear, ought to be discouraged, since from the manufacturer's point of view the wool is damaged. It is a difficult matter to work the stain out, and buyers always make allowance for these defects when making up their purchases.

Sheepskins therefore repay proper attention; and though the processes described may seem rather troublesome, they are easily carried out, and when once the farmer realises the increased price for the better article, there will be fewer low-grade sheepskins on the market.

Skinning.

In removing the skin, it is of course essential that it should be free from cuts or damage of any kind, as otherwise its value is depreciated, inasmuch as the pelt when made into a basil must be put into a lower grade.

To assist in quick and easy work, the sheep should be skinned immediately it is dead, as at that period the skin comes off very much better and is more easily kept clean. It might here be pointed out that the knife is used less in skinning sheep than is the case with cattle, which is advantageous, since there is far more risk of cutting the pelt, which is comparatively thin, than

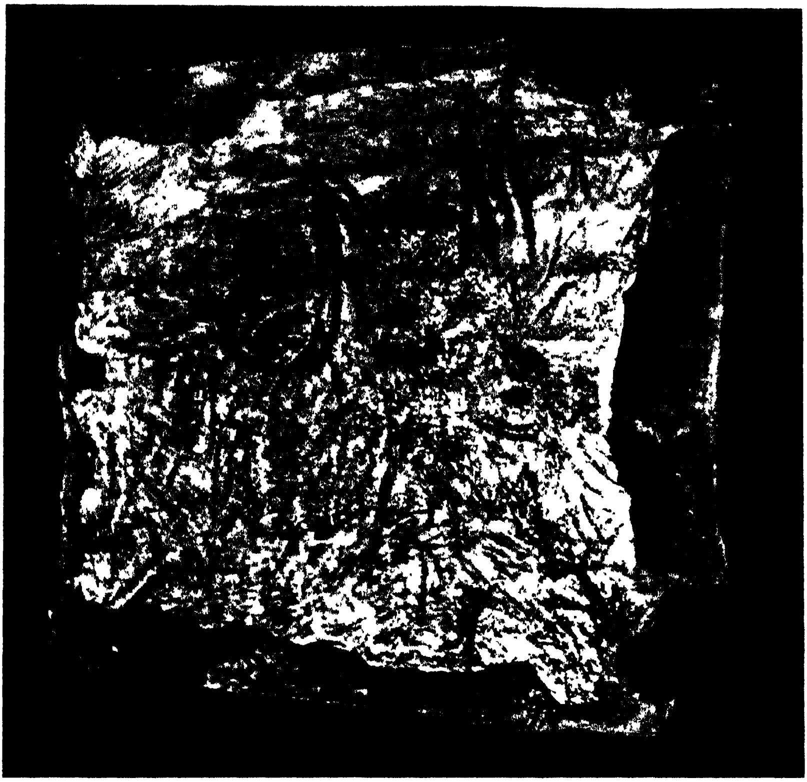


Fig. 8.—Edges of hide turned in.

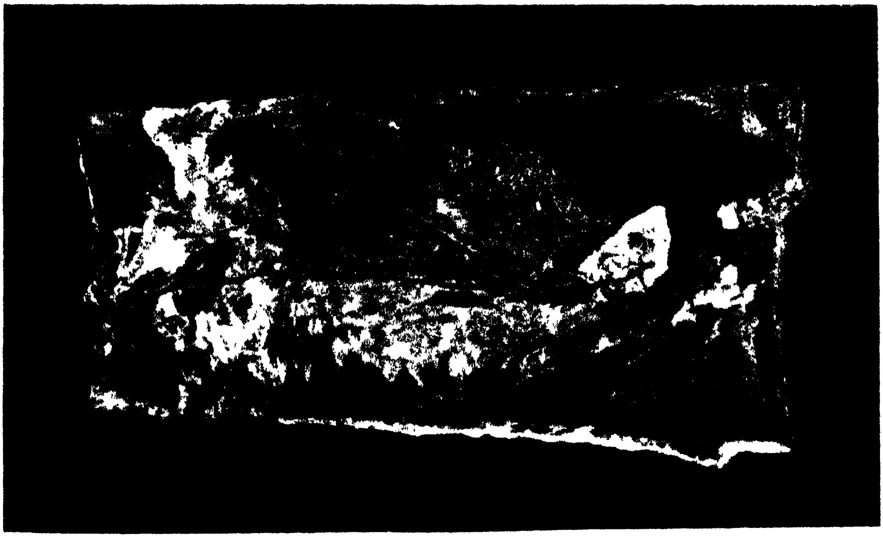


Fig. 9.—Half of each side of hide is turned in lengthways towards the centre.

FOLDING OR "BIBLING" A HIDE

Fig. 10. One side of the hide is placed upon the other

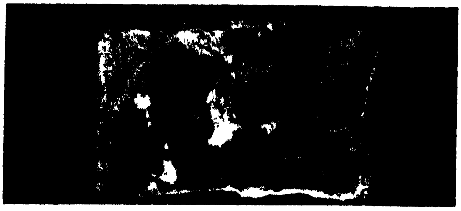


Fig. 11.—Both ends are folded towards the middle.

Fig. 12.—Folding, or "Bibling," completed

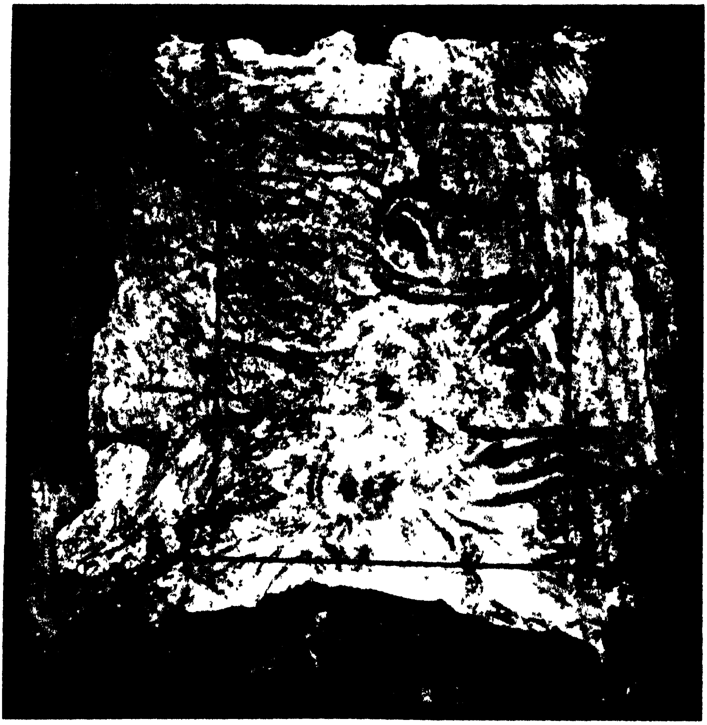


Fig. 13.—Alternative method of folding.

FOLDING OR "BIBLING" A HIDE

the hide. The closed fist is used mostly to punch the skin off, this method being quicker and better than using the knife, though the latter must necessarily be used to open up and start the skin.

Weevil Solutions.

When the skins are to be stored some time, especially in the summer months, it is advisable, as soon after skinning as possible, to paint the pelt with some solution to keep away weevils and other pests which do considerable damage by eating into it and thus reducing its value. Once the weevils get into the skin it is a difficult matter to remove them, and the longer they remain the more damage they do. Care must be taken to paint the pelt thoroughly, as unless this is done the weevils get in at the points and in small pockets and soon riddle the whole piece.

Cheap and effective mixtures for this purpose, and the ones advised by most of the local tanners, are made up as follows, all of the recipes having proved useful:—

1.—Arsenic	4 oz.
Soda crystals ...	8 oz.
Water	1 gallon.

Boil all together until dissolved, and when cool apply with a soft brush.

2.—Arsenic	½ lb.
Soda	½ lb.
Water	1 gallon.

Boil for half an hour.

3.—Arsenate of soda ...	1 lb.
Water	4 gallons.

Boil together.

4.—Soda ash	5 lb.
Barbadoes aloes ...	¼ lb.
Water	4 gallons.

Boil together, and when the mixture rises pour in 1 gallon of cold water. One part of this stock solution to five parts of water would be the proportions to use when required.

N.B.—*All of these mixtures being highly poisonous must be legibly branded, and when not in use kept under lock and key.*

These mixtures are also used for painting dry hides and all descriptions of marsupial skins. Paint the pelt (with an ordinary whitewash brush) with the solution. Be careful to see that the pelts are thoroughly dry before bundling, if this should be done at this stage, as wet skins soon go mouldy and depreciate in value.

Drying.

The next process is the drying, and it is perhaps in this respect that more loss results than in anything else.

Skins should be hung up to dry as soon as possible after removal from the sheep, and not thrown out in a heap, as they are very liable to sweat and in this way be damaged, as well as to get stained and discoloured.

It is a good plan to wash the pelt with warm water, especially round the neck and hind parts, thus keeping them free from blood, &c., for now that light leather (basil) is used so freely it is necessary to send in the very best article to ensure getting higher prices.

Sun-drying is not advisable except during very wet, cold weather, when it might be of advantage during a fine spell to hang the skins in the sun to partly dry and thus prevent the growth of mould, &c. But if continuously sun-dried the oil is drawn out of the pelt, and it is rendered partly useless for leather on account of its tendency to crack easily. Neither should skins be exposed to the weather, as this, too, damages them.

All fat or meat must be removed whilst the skin is warm. Trim off all trotters, tail, and neck-pieces (dry and sell these separately as skin-pieces), and proceed to dry the skin by hanging over a 3 inch x 2 inch batten carrier, or inch piping, or wires, or other support, in the shade, where a good draught of air is available. The skins should be hung flesh-side up, head to tail lengthways, not sideways, spreading the neck end out on the batten so as to give it a better opportunity of drying, as this is generally the dampest part of the skin. A neat, even shape should be preserved. The various points should be seen to, so that they may dry evenly with the other parts of the pelt, otherwise they are apt to curl up and keep in a green state after the rest of the skin is dry.

Where possible, the points of the skin may be kept open by using small pieces of stick, thus preventing any accumulations of blood, &c. If at all damp in the wool, the skin will require to be hung wool-side up for a day or two. It is very important that the skins be quite dry before packing for sale, in order to prevent them going mouldy and rotten.

Bundling.

It is likewise important that the skins be packed in neat bundles or packs and sent to market regularly. Do not attempt storing for any great period, as they lose considerably in value, besides being continually liable to the attacks of weevils, &c., and to become unclean.

When tying into bundles, always see that rope or lashing (do not use wire, as it rusts and stains the wool) is tied round each end as well as across the bundle to prevent skins being pulled out in transit. If desired, they may be packed in woolpacks, placing the skins wool to wool and pelt to pelt.

In bundling, put about twenty skins (medium weights) in each bundle. For full-wools in good condition twelve to fifteen would be quite sufficient. In either case, the bundle should not weigh more than 2 cwt. The skins should be packed wool to wool, not folded, but laid one on top of the other, tied, and in addition to being branded with address label and sender's initials, the number of skins in the bundle should be marked on the label as well as in the advice-note to the broker.

Parasitic Enemies of the Mediterranean Flour Moth.

(*Ephestia Küehniella*, Zeller.)

WALTER W. FROGGATT, F.L.S., Government Entomologist.

THOUGH the writer can find no record of these interesting parasites in the entomological notes in any of the scientific journals of Great Britain, one of them has been well known to the British millers for some time, as is shown by the following reports in their trade journal, *Milling*, published weekly in England.

The first is a letter from Mr. R. C. Ingleby (10th May, 1911), in which, after noting that the use of carbon bi-sulphide is more or less effective, he goes on to say :—

> We believe that we have made a discovery which will perpetually keep in check the moth evil, and so greatly minimise the number of chokes in a mill from this cause. We introduced, and are successfully breeding, an ichneumon fly, which lays eggs in the larvæ of the moth. When these maggots are in the chrysalis stage, the ichneumon eggs hatch out, feed on the living tissues, and, instead of moths emerging, ichneumon flies appear. The flies are in no way a nuisance to the miller, and their numbers are regulated by the supply of larvæ, the latter, naturally, being constantly reduced.
>
> The ichneumon flies have been active in the mill for about twelve months, and, having passed through the winter, seem quite acclimatised. The mill is practically clear of moth cocoons, which used to so rapidly block up the spouts, and chokes from this source are now rare indeed.

A circular was shortly afterwards issued by Messrs. Henry Simon (Limited), of Manchester, which, after reprinting the above paragraphs, states :—

> Since this letter appeared, we have carefully investigated the action of the ichneumon fly in the King Flour-mills, and have satisfied ourselves both that the statements contained in Mr. Ingleby's letter are substantially correct, and that the fly will be a very valuable asset to any flour-mill which is at all troubled by flour moth. We have made arrangements with the King Flour-mills, and are prepared to supply the impregnated larvæ, with instructions as to the best way of rapidly propagating them. All information and assistance will be given to ensure satisfactory propagation, and should the first lot of flies which we supply fail a further lot will be supplied free of charge. Millers adopting this remedy against flour-moth pest will be required to give us an undertaking that neither the flies nor the larvæ shall be resold, or otherwise disposed of, for a period of five years.
>
> The price at which we can supply the impregnated larvæ is to be calculated on the capacity of the mill using them, and is fixed at the rate of 40s. per 100 inches of combined break scratch and smooth roller-surface of the mill, with a minimum charge of £10.

Mr. J. N. Mitchell, manager for Henry Simon, Australia (Limited), called and left me one of the circulars, and informed me that they were proposing to import a consignment of these parasites into Australia to sell to the flour-millers on the above terms, and we offered our co-operation as to suggestions how to treat such parasites when they were imported.

Mr. Mitchell, however, just before making arrangements to import some of these parasites into Australia, received notice that they had been discovered in mills in other parts of England, and therefore abandoned his proposed introduction of parasites. Messrs. Henry Simon (Limited) have since sent out notice, dated July, 1911, under the heading, "Ichneumon Fly":—

> Since last month it has been discovered that the ichneumon fly already exists in sundry mills in this country. From the evidence at our disposal, it would seem to have been introduced in some way into various mills about eighteen months or two years ago. They have, however, not made much progress, except in the King Flour-mills, at Ellsmore Port, as apparently they only multiply very slowly, unless specially looked after.
>
> The flies are very slow in movement, and if they are collected whenever they are found in cold places, and put into roll hoppers, spouts, &c., where they will be warm, and have a good supply of larvæ to feed on, their multiplication is apparently very much more rapid. In view of this development the King Flour-mills have decided not to sell the flies or larvæ, but millers interested in the matter will probably be able to make arrangements to obtain them.

Just about the same time the Government Entomologist of Victoria (Mr. C. French, junior) sent me several specimens of a small parasitic wasp which he had obtained from a flour-mill near Melbourne, where it was said to be a parasite of the Mediterranean Flour Moth.

Soon afterwards I received a large series of living specimens of the same little parasite from Mr. McLeod, of the Great Western Roller Flour-mills, Wellington, New South Wales, with the information that it was very plentiful in his mill. He also enclosed a cutting from their trade journal, *Milling*, 18th July, 1911, in which the English parasite was figured, and wished to know if they were the same insects. In the following month I visited the Wellington Flour-mills, and through the kindness of Mr. McLeod obtained some very interesting information about the habits of this parasite, which I found flying about all over the windows.

On the 19th October the manager had put away in a jar a number of infested larvæ of the flour moth, in which the wasps had been observed depositing their eggs. They were examined while I was there on 15th November, when several parasitic wasps were found trying to escape, so that the life cycle from the egg to wasp in summer-time evidently only takes about a month.

When the parasitic wasps escape from their pupal cases in the mill, they usually fly to the windows and buzz round trying to escape, but many were also noticed resting upon the walls, and on the sides of the spouts and elevators; but they did not appear to like that portion of the mill where the fine flour-dust was deposited, and when one was accidently dusted with flour it at once set to work to clean its antennæ, wings, and legs.

We placed a quantity of waste flour and sharps, webbed together by the caterpillars of the flour moth, along the bottom of the windows, and put some of the wasps upon it. They were soon attracted to the caterpillars hidden under cover of the webbed flour, and commenced to run over the surface, antennæ and wings in motion, while every now and then they stopped and stabbed their ovipositors into the mass of webbed flour containing the caterpillars. They seemed to prefer the caterpillars hidden in the flour to those exposed, for when several caterpillars were removed from their silken tubes and placed on the surface of the flour the wasps walked away and never attempted to stab them.

From information received shortly after this I visited the Federal Flour-mills at Newtown, when Mr. Burgess, the manager, showed me numbers of the same parasitic wasps flying about the mill and buzzing round the windows. He informed me that this parasite had been first noticed in small numbers in the previous year, but this summer they had greatly increased, and he considered that there were nothing like the number of Mediterranean Flour Moths in the mill that there was previous to the advent of the parasite. I obtained a large quantity of waste flour through the kindness of Mr. Burgess, and placed it in our Insectarium to breed out more parasites; but though it was swarming with moth caterpillars in all stages of growth, only one parasite of this species and four others of another kind, bred out of the waste flour, while hundreds of moths appeared in the breeding cages, coming out of the pupæ in the flour.

This bears out the observations which we have made, for Mr. McLeod and his manager said that the moth grubs in the elevators, shoots, and other hidden or closed portions of the woodwork and machinery (where the moth grubs become so abundant as to form solid masses of webbed flour) are not parasitised. The parasites confine their attention to the many flour moth caterpillars that crawl out and pupate in the dust, flour and rubbish on the walls and open places. They cannot, or will not, enter the closed places. So that while the parasites have a considerable value in any mill infested with the Mediterranean Flour Moth when they destroy all the outside caterpillars, they also have their limitations, as they never make their way into the places where the main body of the caterpillars are feeding and pupating.

On referring to Messrs Simon's circular, it will be noticed that it is recommended that "they should be collected and put into the hoppers and spouts"; but it is very doubtful if they would work in such places. There is not the least doubt that the parasites could be greatly increased in the flour-mills, if guttering or ledges were fixed along the walls below the windows, and filled loosely with caterpillar-infested waste flour taken from the spouts and elevators. The parasites coming to the windows and dropping down would find their supplies to hand, and would soon deposit their eggs.

Amorphota ephestia, Cameron, N.sp.

Specimens of this parasite sent to Mr. P. Cameron, the well-known authority upon micro-hymenoptera, have been determined by him as a new species of the genus *Amorphota*, which was created by Foerster in 1868. It is a true ichneumon wasp, belonging to the group *Campoplegini*, a division of the sub-family *Ophioninæ*. All the members of the genus are parasitic upon small moths. Dr. Howard in his paper "A Study in Insect Parasitism" (Technical Series No. 5, 1897, U.S. Division of Entomology), describes a new species (*Amorphota orgyiæ*) bred from the larva of a small American moth, *Orgyia leucostigma*.

A technical description of our species will be given in the proceedings of the Linnean Society of New South Wales by Mr. Cameron. Briefly described, the female measures about half an inch in length from the tips of the antennæ to the extremity of the ovipositor, and without including the antennæ and ovipositor, about one-third of an inch. It has the short, stout thorax and slender curved abdomen of this group of the *Ichneumonidæ*, which in the male is produced into a slender rounded body. It is of a uniform black colour, with the whole of the fore and second pair of legs, except the tarsi, dull yellowish-brown; the long hind legs with the coxiæ, trochanters, and basal portion of the tibiæ dull yellowish brown; the thickened apical portion of the abdomen reddish-brown, with the ovipositor dark reddish-brown. The wings are transparent, slightly clouded, while the basal portions of the nervures are black.

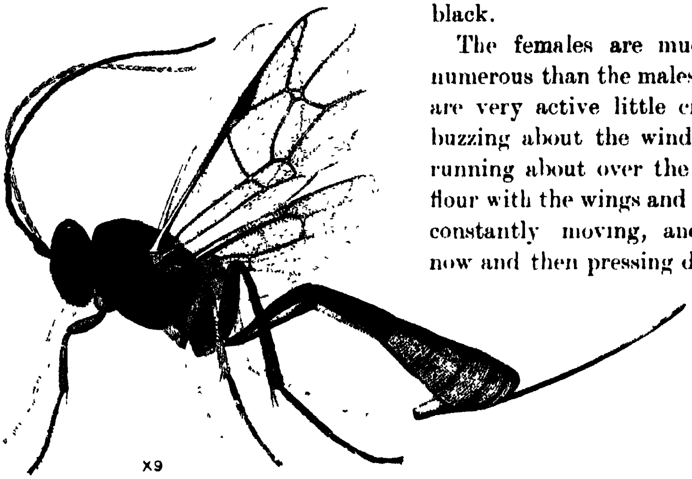


Fig. 1.—*Amorphota ephestiæ*, Cameron.

The females are much more numerous than the males. They are very active little creatures, buzzing about the windows and running about over the infested flour with the wings and antennæ constantly moving, and every now and then pressing down the stiletto-like ovipositor into the matted web and flour. When busy hunting they are so intent on their work that they can easily be picked up in the fingers.

Bracon (Hadrobracon) hebetor, Say.

In waste flour received from the Federal Flour-mills and placed in breeding-cages in the Insectarium, we bred four specimens of this handsome little parasite.

This braconid wasp was described by the American entomologist, Say, in the *Journal of Natural History*, in 1836. In Bulletin No. 8, New Series (1897) of the Entomological Division of the Department of Agriculture, Washington, U.S.A., Dr. L. O. Howard gives a general account and a fine woodcut of this parasite. It had previously been recorded by W. C. Johnson from San Francisco, where he had bred it out of the pupæ of *Ephestia küehniella* (Entomological News, Vol. VI, 1895).

It is of the typical thick-set form of the members of this group, with the antennæ consisting of a somewhat irregular number of short but distinct joints. It measures about one-ninth of an inch in length, with the abdomen turning downward, and the ovipositor moderate in length. The head is rounded, reddish-orange, with the eyes, area round the ocelli, and antennæ black, the upper surface of the thorax and abdomen black, with the central portion of the first deeply blotched with reddish orange-yellow, encircling two small black areas. The legs are reddish brown, with the tarsi lightest The wings are clouded in the centre, the segmental divisions of the dorsal abdominal plates marked with white lines, with the whole of the underside of the abdomen whitish. I have not been able to find a technical description of this little braconid, but in Howard's fine woodcut the markings of head and thorax are identical.

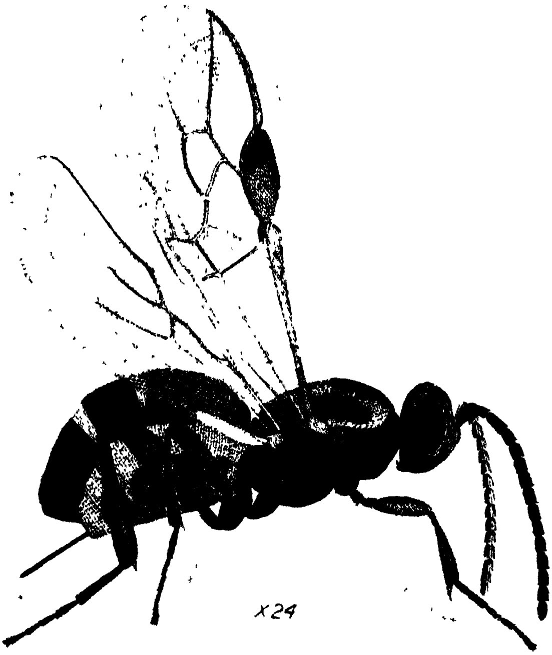


Fig. 2.—*Hadrobracon hebetor*, **Say.**

Other Parasites.

As might be expected, a number of parasites attack a moth so plentiful and widely distributed as the Mediterranean Flour Moth, and the following species have been bred from it and several other pest insects :—

Baker (Entomological News, Vol. VI, 1895), recorded breeding a parasite wasp, which he named *Apanteles ephestiæ*, from the Mediterranean Flour Moth, at Fort Collins, U.S.A.

Bracon brevicornis has been bred from this moth, but has also a number of other different hosts.

Chremylus rubiginosus, Nees, is another braconid wasp, with a wide range over Europe, that has been bred from the Mediterranean Flour Moth, but like the previous species it has a number of different moth hosts, and is even recorded from beetles. It is recorded in *Insect Life*, Vol. II, p. 260, and is figured and described by Marshall in the Transactions of the Entomological Society of London, 1885.

All the described species of the genus *Amorphota* (five in number) have been found in the United States. It is not unlikely that this new species, now described by Mr. Cameron, is a native of North America, and was introduced from that country into England and Australia.

Winter School for Farmers, 1912.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

THE attention of farmers is invited to this Winter School, which lasts for four weeks, commencing on Monday, 17th June, 1912, and terminating on Saturday, 13th July, 1912. Farmers and graziers, or their sons who have worked at least one year on the land, are eligible for admission; the number, however, being limited to 100. A fee of £2 2s. is charged for the course, including board and lodging, &c., at the College. The fee is payable in advance to the Under Secretary, Department of Agriculture, Sydney.

These courses are provided at the slack period of the year for busy farmers and stock-owners, who can devote only a limited time to study and intensive practical instruction. They are thus afforded the opportunity to acquire the greatest amount of directly useful information in the shortest time.

The Winter School Course embraces a variety of subjects, of which it is impossible for one student to take up the whole; but the applicant for admission is requested to state the courses of lectures he desires to attend and the special training he seeks on the farm and other departments.

Railway passes are made available at single rates for the double journey to all students attending the Winter School, and are of five weeks' duration. The pass is obtainable on presenting a certificate signed by the Under Secretary of Agriculture, stating that the holder is a student proceeding to the College to attend the Winter School.

The North Coast Steam Navigation Company, Limited, will also grant a rebate of 10 per cent. off saloon return fares paid by students of the school.

All students are to be subject to the regulations in force at the College. Each must provide himself with towels, sheets, pillow-cases, soap, and boot polishes. The College libraries, reading rooms, gymnasium, and recreation grounds can be used by students of the Winter School.

A programme of all lectures and outdoor work is placed on the College notice-board. Students are expected to select such branches of training as may be best suited to the conditions of their own districts and farms.

A copy of the syllabus, setting out the subjects upon which instruction is given, may be obtained from the Under Secretary, Department of Agriculture, Sydney. Applications for entrance must be forwarded to the Under Secretary not later than 31st May.

The Cultivation of Firbank Wheat for Hay.

E. FIELD, Wave Hill Farm, Coolamon.

THERE is no doubt that Firbank wheat is fast coming into favour as a wheat to grow for hay, and the inquiries for seed of the variety this season forecast a heavy sowing for the purpose. This paper is written with the object of helping those farmers who have not grown the variety before. Like all other varieties of wheat, it has its advantages and its drawbacks, and the grower must become acquainted with them either by his own experience or by that of someone else.

Firbank a Hay Wheat.

It is essentially a hay wheat, and one well worth commending to the notice of the farmer who combines hay and wheat-growing for a livelihood. After a few years' experience with it, in the writer's estimation it easily ranks first as a hay-producing wheat, the quality, colour, texture, and smell of the hay being all that could be desired

It is not only on these points that this wheat excels. As a crop to grow to clean one's paddocks of wild oats, it is equal to anything else I have tried, if not better, as I will point out later.

Amount of Seed.

Like all other crops, it does best on fallowed land. Sow in May at the rate of 50 to 60 lb. to the acre on fallowed land; and on stubble land, 60 to 80 lb. should be sown, with ½ cwt. of supherphosphate to the acre in either case. Some may think this is heavy seeding, but like all other fast-growing wheats, it is a poor stooler. It grows so fast that it does not take time to stool. On new fallowed land, 40 to 50 lb. of seed to the acre, and a like amount of manure, would be ample.

Firbank Wheat and Wild Oats.

If the farmer has fallowed land to plant, in which the wild oats have lain dormant for want of sufficient moisture to germinate them during the period of fallow, sow it down with this wheat before it rains, so as to get it started with the oats. Drill in the seed and manure at the rate stated above, and the result will be that the wheat will soon outstrip the oats in growth right up to the time of cutting, which should take place about a week, or a little less, after it blossoms. The wild oats will then just be coming out into ear, and will be cut with the binder before any damage from re-seeding occurs, it being well known that wild oats shake out with the wind as soon as they are ripe. The oats are sure to sprout from the roots again, through being cut while they were green, but then is the time to act.

The hay should be stooked up as it falls from the binder, and not allowed to bleach in the sun. For quick drying, the stooks should be made with an air passage through the centre. A double row of sheaves on the sides and two at each end will be found the best method, and one that will catch the least rain Stacking should take place in nine to twelve days, according to weather, density of crop, &c.

Then, when your hay is stacked, turn in your sheep to eat off the oats that have already sprouted up, as previously pointed out. If there is more crop left in the same field, and the sheep cannot be used to feed-off the oats, put the ploughs into it and turn it down, and you have a good early summer fallow and the satisfaction of knowing that you have rid your paddock of the greater portion, if not the whole, of the oats in a few months.

The same method will apply equally to stubble paddocks, using plenty of seed and manure. I have used up to 90 lb. of each on third crop stubble land, and then it has not been too thick for June sowing.

There is no other good hay wheat which gives such excellent all-round results as Firbank—all the others are too late. I have adopted the plan outlined, and I have had my hay in the stack, and the ground that it came off ploughed, and have sometimes been waiting for the harvest to come on.

Time to Cut for Hay.

There seems to be a prejudice amongst farmers against cutting hay too green—they like to see the grain in the chaff The best time to cut is about a week after the crop comes out into flower. It is then about at its tenderest period, and you get an evenness of colour from the root right to the top. Hay cut in the sap is much heavier than when it commences to ripen. Stock like it better, and it keeps their bowels in order by supplying what is lacking in dried-up pastures.

Firbank as a Grain Wheat.

Just a word, in conclusion, as to the merits of this wheat for grain. Though by no means a poor yielder, and I believe a fair milling wheat, it is rather a risky wheat to grow for grain. It stands up well during the growing period, but as soon as it ripens it droops over with the wind. If the wind is accompanied by rain the crop goes down very low, making the harvesting process tedious. Being very tender in the straw as well, the harvester takes the straw off where it strikes it, if it has been subjected to too much rain. It is wise not to grow much more than for one's own requirements for grain until the farmer becomes acquainted with it.

The crop responds well to harrowing once or twice in its young stage, and if too early it will stand feeding-off by sheep very well.

Imported Stock and their Progeny.

CATTLE BREEDING AND DAIRY RECORDS.

M. A. O'CALLAGHAN, Dairy Expert.

IN the February number of the *Agricultural Gazette* I dealt with the Shorthorns and Ayrshires; and at the same time, in referring to the Guernseys, I stated that the second importation was not quite as good as the first. On a more detailed personal examination of their performances, however, I am inclined to think that those cows which were sent to the Berry Stud Farm from the second importation of Guernseys were, taking into consideration the larger number, quite as good as the first. Those sent to Wollongbar will come under review later, but as the animals were evenly selected as regards quality, &c., those sent to Wollongbar in 1908 should have given equally as good results as those sent to Berry under similar conditions.

Pure-breeding and Records.

It was Darwin, I think, who first drew attention to the fact that the presence of any trait or characteristic which was not common to a race of animals could not be regarded as permanent. Now, here we have a matter worthy of the serious consideration of all breeders of stud cattle. We must understand that this statement cuts both ways. In other words when a breed of dairy cattle is being developed from an unimproved race, we must expect a fair percentage of inferior beasts for a number of generations, despite the fact that we may continue to use pure-bred sires throughout. In the same way, when a breeder finds that he has obtained an animal of poor milking qualities which has descended for a great number of generations from animals that have been selected dairy cows of pure breeding, it must not be assumed that all the results of these generations of special breeding have been lost in the individual which has given a poor milking record. The milking trait may be only hidden for a generation, and may come forth in the progeny of that animal, provided the cow is suitably mated. It is now acknowledged by all naturalists of note that each animal born obtains not only certain constitutional peculiarities from its progenitors, but also is given a sort of hereditary purse which it must hand on to future generations, unless it is so constitutionally deranged by disease as to be incapable of handing it over in the uncontaminated condition in which it was received. Hence it is that, though the animal itself may not act up to the results expected, through deductions made from its progenitors, the power of passing on those useful traits may not be lost. With regard to pure-bred dairy cows, there is an undoubted opportunity in this direction in the case of the animal that does not give too large a milk yield, because nature is not strained, and sufficient nourishment is always available for the fœtus, so that the calves of such an animal at the time of birth should be extremely well nourished. By all this I do not wish to convey the impression that I advise breeding from bad individuals specially, but I would draw the attention of breeders to the fact that they should not hastily condemn for breeding purposes the individual of a well-known milking family when found to give inferior milk yields, and it is possible that they may obtain very high-class dairy cows from such an individual. Breeders of race-horses have had ample experience of animals bred on what appears to be perfect racing lines, not being in themselves of much value for racing purposes, but when mated with suitable blood giving birth to progeny of the very highest class. Hence it is that the inexperienced breeder who is at all impatient is sure to make a number of mistakes.

As an illustration of this line of argument, I draw attention to the progeny of a Guernsey cow. Saucy Sal (imp.) was the worst of the first importation of Guernseys, as far as milk and butter records went. Her best record was 3,398 lb. of milk, producing equal to 181 lb. butter; whereas her grand-daughter, Saucy Rose, by Calm Prince from Rose Petal, by Rose Prince from Saucy Sal, gave 5,298 lb. of milk with an average of 5·0 per cent. of butter fat, or a production equal to 311 lb. in a milking period of forty-two weeks. Here it will be seen there is a double infusion of Rose Prince Blood, as Calm Prince is by Rose Prince from Gentle.

The point discussed here is further illustrated by the performance of another grand-daughter of Saucy Sal's, namely, Rose Petersen, by Peter (imp.), from Rose Petal. She gave 5,272 lb. of milk, testing 4·6 per cent. of butter fat, in an ordinary milking period. It appears to be evident from these results that through the cow Rose Petal the deep milking line has again been picked up.

In addition, it has to be stated that the bull Saucy Prince, by Rose Prince from Saucy Sal (imp.), proved himself to be a sire of good butter-producing cows, and both on the North and the South Coast there are now daughters of his capable of yielding 2 lb. of butter per day.

Of course, the influence of the bull cannot be overlooked in these cases, but it is an illustration of how by judicious breeding an apparently inferior pure-bred cow may be got to produce valuable progeny. Many a young breeder who has paid high prices for pure-bred stock has been discouraged because of not obtaining high-class results immediately, and many an animal has been sold at a low price which would have been of considerable value if properly mated; and hence it is that successful studmasters must have the gift of patience coupled with great powers of observation.

THE GUERNSEYS.

There were six Guernsey cows and three Guernsey bulls imported in 1898. The six cows were sent to the temporary stud farm, which was then established at Kirkham, and the bull Rose Prince was also sent there, while the bulls Peter and Nutcracker were sent to Richmond River. The six cows were named as follows:—Calm, Vivid, Lady Blanche, Flaxy, Souvenir, and

Saucy Sal. When the Stud Farm was established at Berry, the cows Souvenir and Lady Blanche were transferred to Wollongbar Experiment Farm, but unfortunately the latter contracted pneumonia on the boat to the Richmond, and died soon after landing. There were thus left on the Stud Farm at Berry four female representatives of the Guernsey breed, all of distinct families.

The Calm Family.

Unfortunately *Calm* (imp.) died of milk fever in 1899, after having given birth to a calf later known as Gentle. Calm (imp.) was a fine stamp of a dairy cow, being strongly constituted, with a good middle piece, and a good udder.

Guernsey Cow, Calm II. Back view of udder and hips.

Gentle, by Masher from Calm, met with an accident by which she lost three of her front teeth during the second season's milking. She was never able to feed properly, and hence it is impossible to say what her record would have been had everything gone right. As a heifer, however, she yielded 4,884 lb. of milk, which, it is estimated, produced 248 lb. of butter.

Guernsey Cow, Calm II. Front view.

Calm II.—Gentle was mated with Rose Prince (imp.), and produced the cow Calm II and the bull Calm Prince. Calm II, as the illustrations will show, is one of the finest types of Guernseys and of dairy cows that it is possible to see, and during the last milking season, notwithstanding the fact that her record had been spoiled to a great extent by her being exhibited at the Sydney Show, she yielded 7,548 lb. of milk, which, it is calculated, would have produced 503 lb. of butter, the milking period being forty-one weeks. This cow rarely tested lower than 5 per cent. butter fat, even in the morning's milk, whilst her evening's milk tested as high as 7·5 per cent., and the total solids in her milk repeatedly showed above 16 per cent. It is doubtful if a better pure-bred cow of any breed has ever been at the stud in Australia, and when the Scottish Commissioners were here, they admired this cow more than any cow of the breed which they had seen in England.

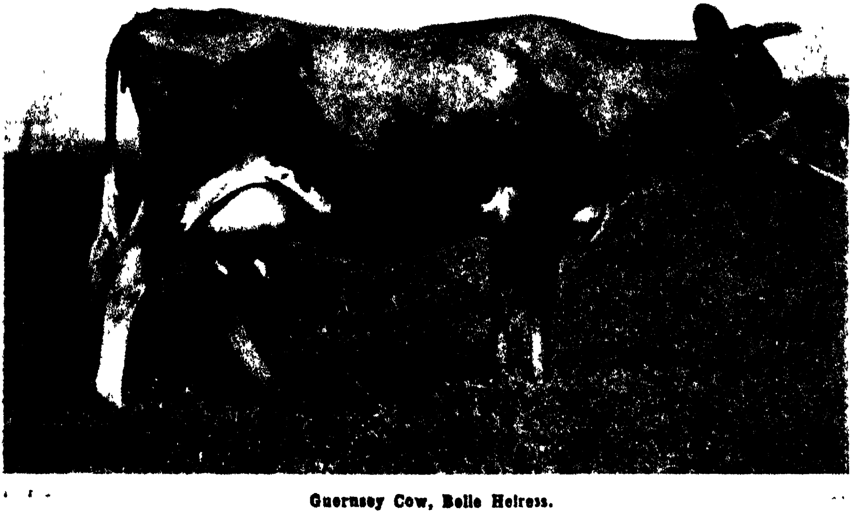
Calm Prince.—This bull was selected by me to take his place at the head of the Guernsey stud long before his sister Calm had produced a calf; and

Guernsey Cow, Bel Air VI (imp.).

judging by the record of Calm II, not only should this bull beget heavy milkers, but females of extraordinary testing capabilities. Calm II was, unluckily, the only female which we obtained from Gentle for some years, but she then gave us Princess May.

Princess May, by Prince of Light from Gentle. This heifer is now on her first calf, and has yielded 3,508 lb. of milk in twenty weeks, and is still giving at the rate of 1 lb. of butter per day. Her sire, Prince of Light, now owned by Mr. J. W. Gillespie, was by Rose Prince (imp.), from Vivid; so she has a double strain of Rose Prince.

The bulls of this family which have been sold or leased, in addition to Calm Prince, already referred to, are:—*Prince of Peace*, sold to Messrs. Kinross Bros., Jamberoo; *Gentle Prince*, for a long time on lease, but now sold to Mr. Lindley, of Port Macquarie; *Prince St. Pierre*, sold to Sir Thomas Ewing; and *Prince Imperial*, sold to Mr. A. W. Perry, near Scone.



Guernsey Cow, Belle Heiress.

The Vivid Family.

Vivid (imp.), was a typical dairy cow with a good bag. She lived to the age of 18 years, and was only then destroyed because she was very bad with rheumatism. It must, therefore, be assumed that she was strongly constituted. In a milking period of fifty-three weeks she yielded 7,985 lb. of milk, which it was calculated produced 459 lb. of butter. Her descendants on the Stud Farm are:—

Vivid II, by Prince Moscow, from Vivid (imp.) This cow on her third calf gave 5,529 lb. of milk, with an average test of 5·1 per cent. of butter fat, equal to a butter result of 309 lb.

Rose Vivid.—This very handsome cow, by Rose Prince (imp.), from Vivid (imp.), has given this season 5,706 lb. of milk (and *is still milking*), with a butter production equal to 335 lb.

Vivid's Pet, by Peter (imp.), from Rose Vivid, gave last year 6,343 lb. of milk, testing 4·6 per cent., or a butter production equal to 343 lb.

Princess Vivid, by Calm Prince from Vivid II, has given this season so far 5,353 lb. of milk, testing 4·8 per cent., equal to a butter production of 303 lb., and is still milking.

Angel Vivid, by Peter (imp.), from Vivid II, gave last milking season, as a heifer, 4,311 lb. of milk, testing 4·6 per cent., or a butter production of 233 lb.

Guernsey Cow, Desdemona VIII (imp.).

Evening Star, by Calm Prince from Vivid II, as a heifer on her first calf, gave 3,579 lb. of milk, testing 4·4 per cent., or a butter production of 185 lb.

There are several bulls of the Vivid family in use throughout the country, both on lease and sold to farmers, and very good accounts are to hand concerning their progeny.

The Flaxy Family.

Flaxy (imp.) gave in thirty-seven weeks 6,443 lb. of milk, which it was estimated produced 334 lb. of butter. Flaxy was a thick-set, strongly constituted cow, and produced calves until she was 15 years old. Unfortunately, however, most of her calves were males, and she has done service through such good bulls as Prince Moscow, Prince Milford, Flaxy's Prince, &c. Her daughter—

Flaxy II, by Rose Prince (imp.), has been an unsatisfactory cow, because she has persistently sucked herself, and therefore, despite various mechanical arrangements, the only records we have of her are not worth much, being 3,333 lb. milk, testing 5 per cent. last year. As will be seen by her photograph, she is a deep-bodied thick-set cow.

Guernsey Cow, Beechwood Pearl (Imp.).

The Saucy Sal Family.

Saucy Sal, by Socialist from Fuchsia, was the only bad cow of the first importation as far as the milk yield was concerned. She was a thick-set beast, inclined to be somewhat fleshy, and only yielded 3,398 lb. of milk, which it was calculated would have produced 181 lb. of butter. Her daughter—

Rose Petal, by Rose Prince, died as a heifer, and the only record we have of her is unfinished on her first calf, this being 2,415 lb. of milk with a test of 5·3 per cent., equal to 144 lb. of butter.

Saucy Rose, by Calm Prince from Rose Petal, referred to in the introduction, has, however, yielded 5,298 lb. of milk with an average test of 5 per cent. of butter fat, or a butter production of 311 lb. This season she is milking well, having, so far, yielded 3,908 lb. of milk in twenty-one weeks.

Rose Petersen, by Peter (imp.), from Rose Petal, is another of this family, her record being for the year's milking, 5,272 lb. of milk with a test of 4·6 per cent., or a butter production of 283 lb. This shows that the milking line has been picked up in this family (because we must assume that the ancestors of Saucy Sal had been bred for milking for a large number of generations), for when two such young cows as Saucy Rose and Rose Petersen are produced, it shows that there is no fluke in the restoration to good milk-yielding capacity.

The Souvenir Family.

Souvenir, by Socialist from Necklace. This cow is now 17 years old, and is still at Wollongbar. The first year after her arrival there she gave 4,943 lb. of milk, with a test of 4·9 per cent., which it was calculated produced 331 lb. of butter.

Second Importation of Guernseys (1908) and their Yields.

Name.	Sire.	Dam.	Milk.	Fat.	Butter.	Remarks.
			lb.	per cent.	lb.	
Bel Air VI (imp.) .. .	Sequel's Crescendo .	Bel Air IV	6,316	4·8	357	
Belle Heiress . .	Pride of the Friquet.	Bel Air VI (imp.) ..	6,407	5·1	386	In 50 weeks
Shamrock of Les Vesquesses (imp.).	Jap (1,513) .. .	Shamrock of Les Vesquesses	4,941	4·0	285	
Hayes' Muzette . ..	V.C.	Hayes' Muzette II	5,10	4·8	288	In 1910.
			5,620	4·6	304	In 1911.
Parsons' Red Rose	Robert's Success ..	Parsons' Red Rose ..	5,840	5·7	394	In 29 weeks this season. Now giving 2 gallons per day.
			4,781			
Rohais Lassie (imp.)	King of the Friquet..	Dolly Gray I . ..	5,406	5·2	332	
Rohais Lassie II (on first calf)	Billy's France ..	Rohais Lassie .	4,540	4·5	240	
Beatrix XIV	Royal Blood . ..	Beatrix VII ..	6,442	4·8	364	In 44 weeks
Rosey VIII	Bloomflower II .	Rosey III . .	7,732	4·5	409	
Muriel XIX	His Grace II . .	Muriel XIV . .	3,156	4·8	178	
Claudia's Pride (on first calf)	Permit	Itchen Claudia .	3,845	4·5	203	Bad year
Clatford Richesse (heifer) ..	Why Not of Calais ..	Richesse of Calais .. .	4,898	4·9	283	

Shamrock of Illawarra, by Jap I from Shamrock of Les Vesquesses VI, has given 11½ lb. of butter in a week, now milking on her second calf.

Beatrix of Berry (heifer), by Calm Prince from Beatrix XIV, now milking on first calf, has given 12½ lb. of butter in a week.

It is thus seen the progeny reared at Berry, viz., Belle Heiress and Rohais Lassie II, promise to be superior to their dams.

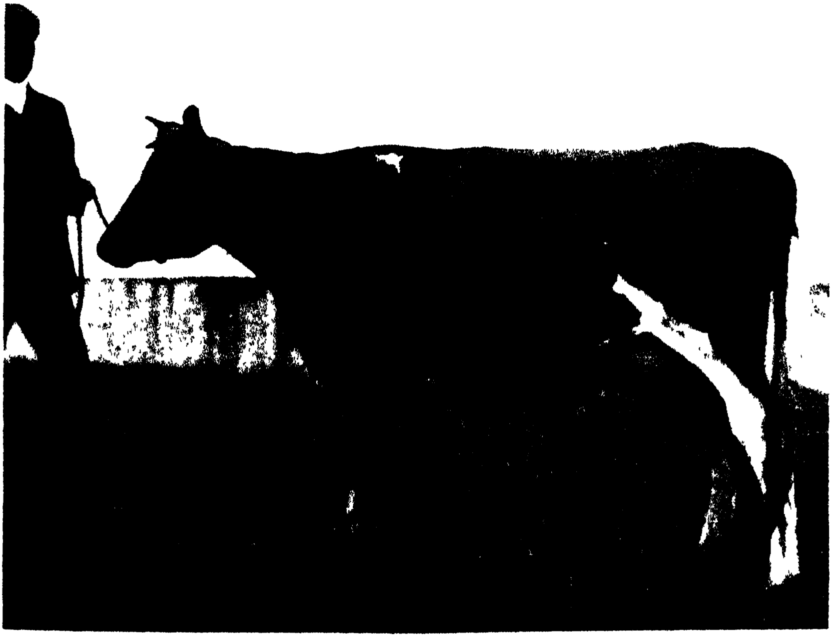
Guernseys Imported in 1911.

Three Guernsey cows imported last year are on the Stud Farm, viz., Flower of the Preel, Desdemona VIII, and Beechwood Pearl. Flower of the Preel gave 238 lb. of milk the fourth week after calving; Desdemona gave 265 lb. the third week after calving; while Beechwood Pearl gave 218 lb. of milk the third week after calving.

THE JERSEYS.

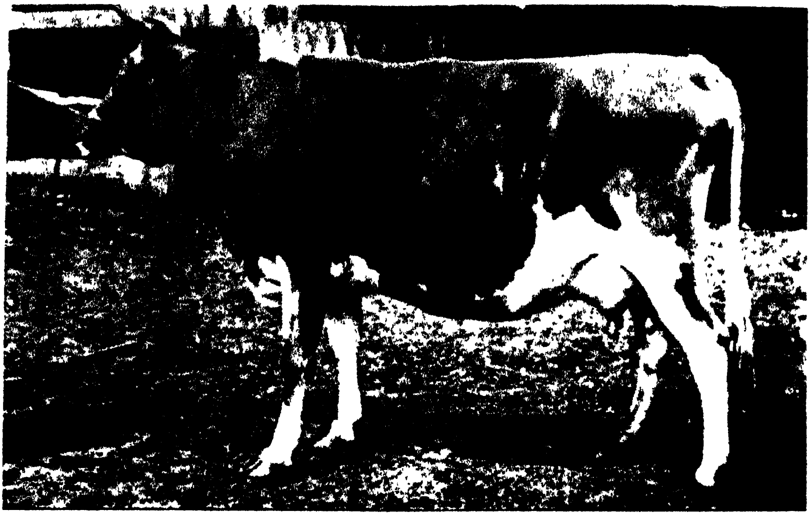
The original importation of Jerseys, made by the State Government in 1898, consisted of four bulls and six cows. Three of the bulls were sent out on lease to dairy farmers, while the fourth animal, Melbourne (imp.), was

Guernsey Cow, Calm II.



Guernsey Cow, Rose Vivid.

IMPORTED STOCK AND THEIR PROGENY



Guernsey Cow, Flaxy II.

Guernsey Cow, Flower of the Preel (imp.).

IMPORTED STOCK AND THEIR PROGENY

sent with the six cows to the Stud Farm. The Jersey importation may be characterised as an entirely satisfactory one, because there was not a bad cow in the six, and there were two of great outstanding merit, in type, producing capacity, and breeding qualities. These two were Rum Omelette and Lady Tidy, whilst Calceolaria and Egyptian Princess, though equally good as producers, were not quite so typical of the accepted standard of the breed as the other two. Miss Lucy was probably the best dairy cow of the six.

The bull Melbourne came of an extremely successful family, his sire having been a noted prize-taker, and his grandsire, Golden Hero, was also a noted winner in the island of Jersey, where, as it is well known, merit is judged mainly on an animal's accepted ability to produce good milking stock typical of the breed. Unfortunately, however, Melbourne produced very few females while at the Stud Farm with us, and for the first two or three years every calf born was a male.

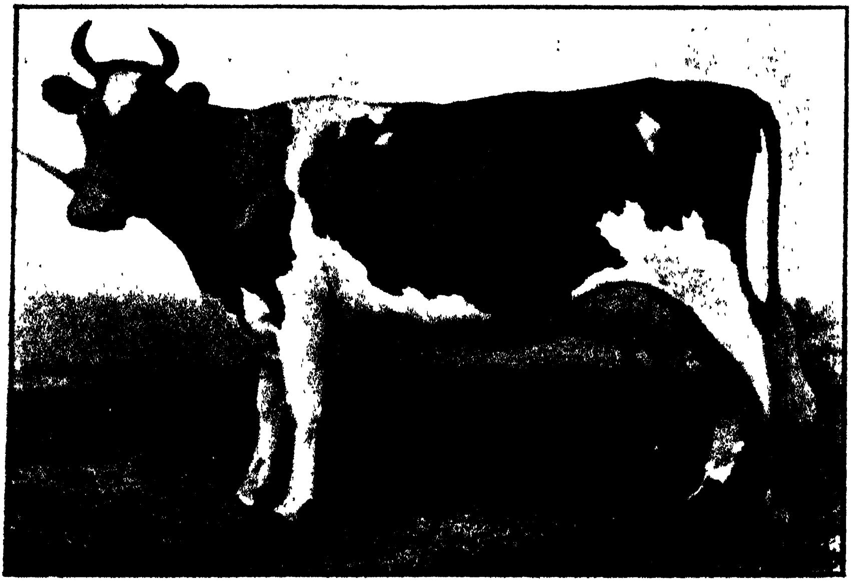
Guernsey Bull, Hayes' Fido.

Among the other three imported bulls was Golden King (176) by Golden Sea, himself a prize-winner in England, and the son of a cow that gave 780 gallons in a season.

Through being mated with the imported cow Colleen, a descendant of the famous Golden Lad, Golden King has left some of the best Jersey blood at present in Australia, as his son, Golden Lord, has produced high-class dairy Jerseys, and has begot bulls that have done likewise.

The 1898 importation was the only one made by the State of Jerseys until last year, when two bulls were imported; but through the bulls bred on the Stud Farm, Jersey blood of good characteristics has been distributed through the various districts in the State, and the other State Farms have also benefited through an infusion of good blood, obtained by the use of the Jersey bulls bred at the Berry Stud Farm. For instance, the Wagga herd, which is a now a first-class one, has been built up by the use of such bulls as Golden Lord, Colleen's Golden Lad, and also the bull Coral's Lad, which was purchased from the Coolangatta stud originally.

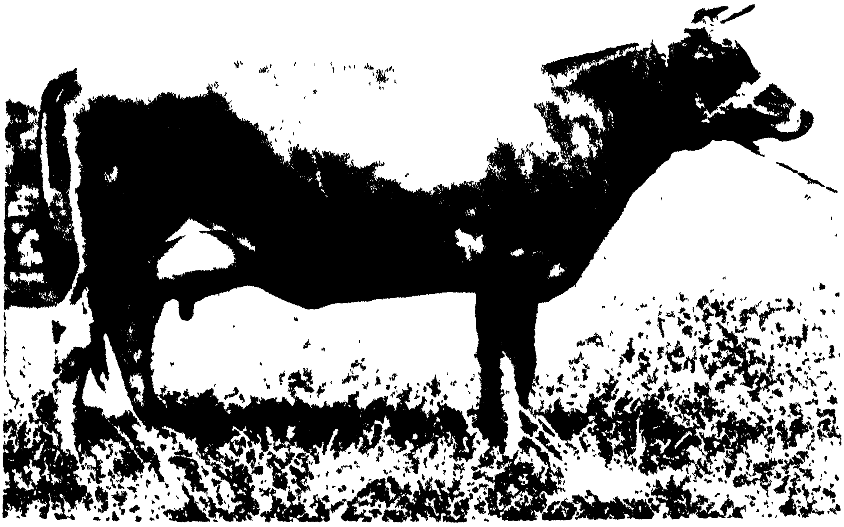
Some bulls of considerable excellence have undoubtedly been produced from the animals referred to as being imported in 1898, and the bulls sold from the Stud Farm have won prizes in strong competition throughout the State. The bull Sir Jack, now the property of Mr. Henry O'Meara, Bangalow, remains undefeated; and a daughter of the same bull was awarded Champion Jersey Female at the National Show held at Lismore in 1910, while at the last Lismore Show she was placed second in the butter test, by no means a mean performance for a cow on her second calf. Moreover, it was only last month at the Berry Show that a yearling son of Sir Jack, recently sold from the Stud Farm, was awarded first place in a strong class, the judge, Mr. W. W. Wren, considering him a youngster of unusual merit.



Guernsey Cow, Beatrice (Imp.).

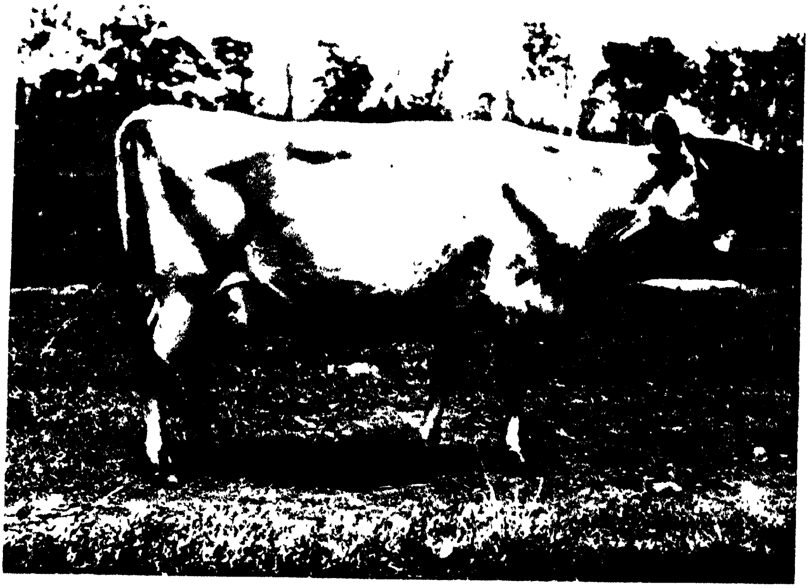
I think it will be seen before this series of articles is concluded, that the Jersey cattle introduced by the Department of Agriculture in 1898 have left a valuable impression on the Jersey blood of New South Wales, and

Jersey Cow, Golden Omelette, by Sir Jack.



Jersey Cow, Lady Pat; by Sir Jack from Pattibelle.

IMPORTED STOCK AND THEIR PROGENY.



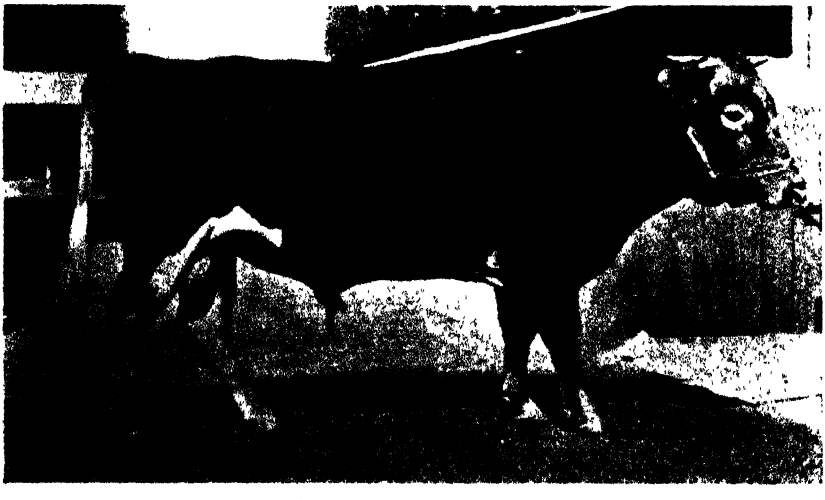
Jersey Cow, Lady Tidy III (Imp.); aged 18 years.

Jersey Bull, Best Man.

IMPORTED STOCK AND THEIR PROGENY

have done a good deal towards stimulating an interest in that breed by farmers, who, at one time, looked upon the Jersey as a weedy animal of poor constitution and with little power of withstanding attacks from disease germs.

The great constitution of some of the animals imported is evidenced by the fact that the cows Rum Omelette, born in July, 1894, and Lady Tidy III, born in March, 1894, are still living, and are still regular breeders; while Calceolaria, born in June, 1896, was a regular breeder up till the present year; and Egyptian Princess, born in 1895, was a regular breeder until 13 years old. The other two imported cows, Miss Lucy and Colleen, died after suffering from intestinal disturbance in 1900 and 1901 respectively. The extreme drought caused the available fodder, grass, &c., to be very indigestible, and a number of cattle died from stomach and bowel troubles throughout the State at this period.



Guernsey Bull, King of the Roses; from Rosey VIII (Imp.).

The Lady Tidy Family.

Lady Tidy III, born March, 1894, by Lord of the Isles, 4612; dam, Lady Tidy, by Sir Joe, 3799. This was undoubtedly the handsomest animal of the importation, though closely run in that direction by Rum Omelette.

Lady Tidy comes of a noted family. With Lady Tidy IV, and her sire, Lord of the Isles, she won the Challenge Cup at the Bath and West of England Show, Cardiff, for the best group of Jerseys, the property of one exhibitor, in 1898, just prior to her purchase by this Government. She won several individual prizes as well, and since her importation into New South Wales has produced a number of bulls that have proved of great merit.

The illustration given shows this cow as she is to-day, deep-bodied, and yet apparently strong, though 18 years old. Though never forced for milk-yielding purposes, and being a regular breeder every year, she gave us, in a milking period of thirty-eight weeks, 5,678 lb. of milk, with an average of 5 per cent. of butter-fat, or a butter yield of 333 lb. Had she been specially fed, instead of being maintained on pasture, she no doubt would have added 25 per cent. to this production, but she was wanted for breeding valuable animals for the stud, rather than for the production of large quantities of milk, which would stop the nourishment of her progeny at a time when it was most wanted. That the policy followed has been a good one is evidenced through the progeny produced, and such bulls as Sir Jack, Best Man, Tidy Punch, &c., which she has given to the stud, and which have, in their turn, produced stock of the class illustrated here, show that vitality, prepotency, and productive capacity have resulted.

Guernsey Bull, Village Favourite (imp.).

Unfortunately, Lady Tidy has given us but two females, all the rest of her progeny being males. The following prices have been given or offered for her progeny :—

Sir Jack, 175 guineas, purchased by auction; *Best Man*, 75 guineas; *Best Blood*, 100 guineas, offered at last Sydney Show; and this season there will be, all going well, a yearling son of hers on non-competitive exhibition at Sydney Show. I have been informed by Mr. Wilson that an offer of 200 guineas has since been received for Best Man.

Lady Tidy IV, by Golden Lord from Lady Tidy III (imp.), on her first calf, gave 3,174 lb. of milk, which tested 4·5 per cent. butter fat. She died after giving birth to a dead calf.

Leading Lady, by Berry Melbourne from Lady Tidy IV, born January, 1909. This heifer promises to represent the Tidy strain in the family line in a satisfactory way. She will be exhibited at next Sydney Show in non-competitive class. She has, as yet, no milk record.

The bulls descended from Lady Tidy III (imp.), and sold are:—*Tidy Punch*, to Mr. Muscio, of the Hastings River; *Tidy Boy*, to Messrs. J. and J. Cornwell, Tweed River; *First Choice*, to Mr. Hegerty, of Singleton; *Best Man*, to Mr. Wilson, of Dorrigo; *Tidy's Hero*, to Mr. A. Vickery, Uralla; and last, but by no means least, the Champion bull, *Sir Jack*, to Mr. O'Meara, Richmond River.

Jersey Cow, Rum Omelette (imp.), 18 years old.

The Rum Omelette Family.

Rum Omelette (imp.), by Athol Brose (4472), dam Omelette II, by Ormonde II (3610). A photograph of this cow is given as she is to-day, and readers will be able to form their own conclusions as to her character and type, especially when it is remembered that she is now almost 18 years old. She has been a regular breeder, and has not missed giving us a calf every year since her importation in 1898. Like Lady Tidy III, however, she has produced bulls almost on every occasion, and her blood, through these bulls, is distributed throughout the State. Her best milk yield on ordinary grass parture was 6,077 lb. in 34 weeks, which produced 332 lb. of butter. Rum Omelette has never been shown, but it is pretty safe to say that she would have had a long record of prizes to her credit had she been exhibited in competitive classes in this country. She was bred by a man who paid special attention to milk production, and who was a well-known prize-winner in butter tests, namely, Mr. O. Mutton, of Plumbton, Sussex, England.

Like all our stud cows, Rum Omelette has been utilised for breeding purposes rather than for milk production, because our policy is, that when a cow shows herself to be a sufficiently good producer to come up to our standard, we think our purpose will be best served by saving her future energies for breeding purposes, so that animals may be produced from her which will take their part in improving the dairy cattle of the State.

Rum Omelette's best sons are:—

Berry Melbourne, sold last year to Mr. Henderson, of Ballina, and the sire of the young bull for which £100 was offered last season.

Melbourne Punch, sold to Mr. Potter, of Dungog.

Omelette's Pride, sire of Sir Jack, sold to Mr. J. Brown, Tweed River.

Other young bulls from this cow were sold to Mr. Higinbotham, of Armidale; Mr. O. Gollan, of Woodburn; and Mr. T. McReynolds, of Barrington; while the stud bull now at Wollongbar, Jamaica Jack, is by Sir Jack from Rum Omelette (imp.). It will thus be seen that this old cow has a number of male representatives acting for her.

Jersey Cow, Golden Omelette, showing udder.

Her female representatives at the Stud Farm are:—

Rum Omelette II, by Golden Lord from Rum Omelette (imp.). This young cow's milk yield is very creditable, she having given 5,667 lb. of milk in the year, which tested 4.4 per cent., or a butter production equal to 361 lb. She is an extremely persistent milker, and is difficult to get to go dry.

Golden Omelette, by Sir Jack from Rum Omelette II, a photograph of which is given, is one of the finest heifers of her breed in Australia. As will be seen by the pedigree, she is a line-bred animal, Sir Jack being a grandson of

Rum Omelette (imp.). This young cow gave 12¾ lb. of butter per week this season when three weeks calved. There is a young heifer, a full sister to this cow, which has not yet come into milk, namely :—

Lady Gay.—This concludes the female progeny of Rum Omelette (imp.)

The Calceolaria Family.

Calceolaria (imp.), by Woolloomooloo, sire of Melbourne (imp.) ; from Cactus, by Little Demon (4910). This was a very thick-set cow, with great digestive capacity, and a notably good feeder. She never looked poor, and was a regular breeder. As can be seen, she came, on the sire's side, from a noted prize-winning family, and her granddam, Meggie, an island-bred cow, was a first-prize winner at the Bath and West of England Show in 1892. Calceolaria's best milk record on grass food mainly was 5,841 lb., which produced 247 lb. of butter. Like the other cows, she was never forced to see what she could yield, and this record was produced on ordinary fare. Her daughter—

Jersey Cow, Lally Optician.

Calceolaria II, by Thessalian, 5,416 (imp), gave, on her first calf, 4,740 lb. of milk, which produced 326 lb. of butter.

Calceolus, by Tidy Punch from Calceolaria (imp.), is an extremely persistent milker, and has given 6,326 lb. of milk in a lactation period of 58 weeks. This year she has given 5,743 lb. of milk in 48 weeks, and is stiil milking. She is a good tester, having averaged 5·2 per cent. last period, so that her production was 388 lb. of butter.

Maid of Athens, by Sir Jack from Calceolaria II, is also a good representative of this family, she having given, on her first calf last year, 3,488 lb. of milk, with an average test of 4·9 per cent. of butter fat, or equal to 201 lb. of butter.

Culcairn, by Melbourne (imp.) from Calceolus, is a very handsome young Jersey, who is now on her first calf. As will be seen, there is a double cross of Golden Hero blood in her, as he is the grandsire of Melbourne and the grandsire of Calceolaria. She gave a little over 9 lb. of butter per week when four weeks calved.

Among the bulls sold of the Calceolaria family are:—

Calceolaria's Lad, sold to Mr. J. W. Pearce, Jerry's Plains.

Golden Hero of Berry, to Mr. J. T. Junior, Casino, in 1902, an animal that has left his mark, and has earned for himself a great reputation on the Richmond River. The progeny of Golden Hero of Berry, at Mr. Junior's clearing-out sale, put up a record for sales hitherto conducted in that part of the country, and £100 was offered for the old bull at the sale. His progency have won numerous prizes at the Richmond River Shows, and as he was by Golden Lord, he had undoubtedly valuable strains of Jersey blood in his veins.

First Capital was also a son of Calceolaria (imp.) by Melbourne, and was sold to Mr. Dalton, of Orange; while the bull *Melbaleria*, by Melbourne from Calceolaria II, was sold to Mr. Fourter, whose farm is near Eden. Another son of the old imported cow, named *Hero*, by Lord Melbourne, was sold to Mr. Warner, of Armidale; and another bull, *Calceolo*, by the same sire from Calceolaria II, was soid to Mr. Warlters, of Hastings River. Another, *Captain Cook*, was sold to Mr. Priestly, of the Paterson River.

This is sufficient to show that the blood of Calceolaria (imp.) is freely distributed about the State, and it is a point in favour of the imported bull Melbourne to find that his half-sister by the same sire has produced such a good milking family in addition to being a good milker herself.

The Egyptian Princess Family.

Egyptian Princess, by Pickwick (4964) from Egyptian Queen, an island-bred cow by Solomon's Lad (3817), was a dark fawn cow, typical of the breed, and when shown as a heifer in strong competition at the Royal County Show, was highly commended. She was born in 1895, and continued breeding until 1908. Her sire was a good winner at some important English Shows, and her dam received a ticket of commendation at the Royal Show of England.

Egyptian Princess yielded 5,334 lb. of milk, with an average test of 5·2 per cent., or a butter production equal to 326 lb., in a milking period of forty-three weeks. She has given us a number of females, some of which have been transferred to other farms, but her best was:—

Egypt's Glory, by Sir Jack, born 1907. This young cow in 1911 gave 6,154 lb. of milk, with a butter production equal to 399 lb.

Egyptian Belle, by Tidy Punch from Egyptian Princess (imp.), yielded 3,937 lb. of milk, with an average test of 5·2 per cent., or equal to a butter production of 241 lb., on her second calf.

Lady Kitchener, by Lord Melbourne from Egyptian Princess (imp.), is a heifer who yielded 3,192 lb. of milk at an average test of 5·5 per cent., or equal to 175 lb. butter.

Queen of the Nile, by Sir Jack from Egyptian Princess; born 1908; on her first calf gave 3,159 lb. of milk, testing 5·0 per cent., equal to a butter production of 186 lb., and is now, on her second calf, giving at the rate of 9½ lb. of butter per week.

Queen of Sheba, by Melbourne from Egyptian Princess, was transferred to Wollongbar Farm as a heifer.

Beauty of the Nile; sire, Sir Jack; dam, Egyptian Belle; born 1909; is now milking, having recently given birth to her first calf.

Bulls of this family that have been sold or leased are *Prince Melbourne*, sold to Mr. W. H. Matthews, of Cootamundra, in 1902; *Kitchener*, sold to Mr. E. Field, of Orange, 1901; *Khartoum*, sold to Mr. T. Rogers, of Bega, in 1900; *Kaid of Khartoum*, by Sir Jack from Egyptian Belle, now at Yanco Experiment Farm; *Thessalian II*, by Thessalian (imp.) from Egyptian Princess, now doing stud duty at Wagga Experiment Farm; *Dreadnought*, sold to Miss Robinson, Melbourne; and *Dinizulu*, sold to Mr. Campbell, of Bulahdelah.

The Miss Lucy Family.

Miss Lucy III (imp.), by Rosey's Boy (4993) from Miss Lucy. Miss Lucy III was a great cow, but unfortunately she died two years after having been imported. On her first calf she yielded 5,542 lb. of milk, and her dam had a record of 6,595 lb. of milk between 8th July and 1st December, 1887.

Miss Lucy III (imp.) was awarded first prize at the London Dairy Show in 1897, so it is seen she obtained the highest honours.

Lucy's Pride, by Melbourne from Miss Lucy, was the only representative, and as he got Omelette's Pride, the sire of Sir Jack, we have the Miss Lucy blood well represented in our stud herd to-day.

The Colleen Family.

Colleen (imp.), was by Mabel Lord (4255) from Colleenette; and as Mabel Lord was by the celebrated Golden Lad, she had some great prize-winning and milking blood in her veins. Before leaving England she gave 12 quarts of milk for some time daily on her first calf. We obtained no females from Colleen, but she gave us—

Golden Lord, by Golden King (imp.), and *Colleen's Golden Lad*, by Melbourne (imp.), so that she has left us some representative blood. Golden Lord sired, among others, the noted bull Golden Hero of Berry, and a large number of fine heifers for private breeders, to whom he was leased, as well as a considerable number of females born at Wagga Experiment Farm, where he was stationed for some years.

The Colleen blood, through Golden Lord, is now at Wagga, Yanco, and Wollongbar Farms, and the Golden Lord females, milking at Wagga, have in almost all cases given good results. But this will be shown later on when the Wagga cattle records are being dealt with.

Other Strains on the Stud Farm.

Pattibelle was not imported by the New South Wales Government; her mother was brought to Australia by the late James McCulloch, and she was carrying Pattibelle at the time. I purchased Pattibelle at Mr. McCulloch's clearing-out sale. She was then dry, but when she came into milk she did not prove of much account as a milk-producer, though she is one of the highest testers I have ever known. Her dam, Claribelle (imp.), was Champion Jersey female at the Royal Melbourne Show, and Pattibelle as a yearling obtained first in her class and reserve champion to her mother. At the time of her purchase she was carrying a calf, afterwards named—

Bellona, by Optician (imp.). Bellona is a thick-set, strongly constituted beast, whose record on the Stud Farm is 4,362 lb. of milk, testing 5·9 per cent. on the average, or equal to a butter production of 304 lb. It is seen that this cow preserves the very high testing quality of her mother, but is a larger milk-producer.

Lally Optician, by Sir Jack from Bellona, gave 3,638 lb. of milk on her second calf, testing 4·6 per cent., or a butter production of 197 lb.

Lady Pat, by Sir Jack from Pattibelle, born 1909, is a promising heifer with an extremely well-balanced udder, as the photograph given herewith shows Three weeks after calving she gave 172 lb. of milk in the week, testing 7 per cent. fat.

SEED-BED FOR LUCERNE.

BULLETIN No. 120 of the University of Nebraska Agricultural Experiment Station, "Alfalfa Management," recommends that in most cases land which is to be sown with lucerne should be disked before it is ploughed. It is pointed out that this will prevent the accumulation of a layer of clods and coarse material in the bottom of the furrow, thus avoiding cutting off the supply of moisture. When the land is ploughed, a harrow should follow immediately to break up the clods, and save the moisture. This is best accomplished at the time of ploughing by the use of an additional horse and one section of harrow, or by a small harrow or pulveriser fastened to the plough. If the land has not sufficient time to become packed by the rains before seeding, a disk well weighted and set as straight as possible will firm the soil in the bottom of the furrows. Weeds should be kept down, and a soil mulch maintained. At seeding time the field should present the appearance of a well-prepared garden.

Clovers and Tares.

[As an answer to numerous inquiries received by the Department respecting these leguminous crops, the following notes are extracted from the "Farmers' Handbook." They were compiled for the Handbook from information supplied by the Hawkesbury Agricultural College, and Bathurst and Glen Innes Experiment Farms. Copies of the "Farmers' Handbook" may be obtained from the Government Printer, Sydney; price, cloth, 5s.; paper, 3s. 6d.; postage extra.]

I. CLOVERS.

Clovers possess qualifications which make them peculiarly suitable for the dairy-farmer and pig-raiser; they are also suitable for the poultry-farmer who requires green feed. They are rich in protein, and in this respect are equalled by few other green crops. As a rule the cereals, including maize and sorghum, form the chief supply of green feed, but they are deficient in protein. To obtain the best results from the feed, it is necessary to supply this deficiency by feeding more flesh-forming foods. Bran and oil-cake are usually purchased for this purpose, but their function in the nourishment of animals can be economically replaced by leguminous crops such as clover and lucerne. The latter is deservedly the most popular because of its permanent nature and its greater suitability for conversion into hay. Still several of the clovers make excellent hay and also silage. On almost every farm there is room for the extension of the growth of clover.

Several varieties are available, all of which differ in some respect, the most important difference being the length of their life. They are divided into perennial, biennial, and annual kinds, and the choice depends upon the climate. They essentially require temperate conditions, and experience has shown that in hot climates the perennial varieties, with the one exception of White Dutch Clover, are not satisfactory, and that only annuals which can be grown in the winter are suitable. The perennial varieties, of which Perennial Red Clover (*Trifolium pratense perenne*) is chief, are preferable where the cool climate, so essential to their growth, prevails. Red clovers stand the summer well on the higher tablelands, such as New England, especially on the clay soils.

VARIETIES.

A. Perennial Varieties.

White Dutch Clover (*Trifolium repens*).

This perennial variety is a useful pasture plant. It is not recommended as a soiling or hay crop as it does not grow tall, but it forms a most valuable addition to pastures. It grows on almost all soils, in nearly all climates, and is very palatable and easily digested. It is one of the few plants that can grow successfully with *Paspalum*. It will thrive under hotter and drier conditions than most varieties, though it must be remembered that clovers will not do well under extreme temperatures.

It has deep main roots, and has a creeping habit, rooting from the stems as it spreads about. The flowers are set on long stems, and are white, with a brownish tint, and roundish in shape.

Perennial Red Clover (*Trifolium pratense perenne*).

Very similar in appearance to the common Red Clover (*Trifolium pratense*) referred to below; but perennial in nature, with the stems more solid and the flowers of a darker purple. On the cool tablelands it is preferred for permanent pasture.

Alsyke or Swedish Clover (*Trifolium hybridum*).

This is probably a cross between Red and White Dutch Clover, perennial in habit. The stem is solid, but the plant has more of a creeping nature than the Red Clovers. The flowers are pinkish white; the leaves are like those of White Clover, but larger and sharper at the points. It grows well in cold, moist situations; but hot, dry conditions would not suit it.

B. Biennial Varieties.

The most valuable of these is Common or Red Clover (*Trifolium pratense*). It has strong, deep roots somewhat fibrous in nature, stems usually hollow, with leaves large and broad, generally strongly marked with crescentic bands; the flowers are usually of a light purple colour, massed together, and forming oval-shaped heads. It is a biennial, but may be carried on in a pasture for a number of years in New England by allowing it to seed in the autumn of each second year. Running the harrows over when the heads are brown and withered helps to shake out and distribute seed evenly. There is a fertilising agent other than the bumble-bee which frequents clover paddocks, and which promotes sufficient seed for carrying on a pasture. It is very useful as a rotation crop and for ploughing in when green, as it provides both organic matter and nitrogen to the soil. It can be sown to advantage with the wheat crop, as the two plants of different natures are helpful to one another. Wheat is a capital nurse crop, and oats might be used as a substitute. Red clover makes excellent hay; it should be cut when in nearly full blossom, great care being taken to save the leaves.

C. Annual Varieties.

These are undoubtedly the more valuable in this State, as they can be grown during the winter months in the hot, dry districts.

Crimson or Scarlet Clover (*Trifolium incarnatum*).—This is the most important annual clover, and is extensively grown. It will grow in poorer soils than most clovers; and it makes capital green feed for all kinds of stock, as well as being useful in silage. It is also a very important crop in rotations, on account of its high nitrogen-content.

The flower heads have a very attractive appearance when in bloom, being scarlet or crimson in colour, as its name implies. It is as a green manure crop that it is most valuable. It helps to renovate the soil, and other crops do well after it has been grown.

It, in common with other leguminous crops, is enabled by micro-organisms functioning in nodules upon the roots to fix the free nitrogen of the atmosphere permeating the soil. This fixed nitrogen is available for the plant—is stored up in its tissues, and becomes available for future crops after decomposition if the plant is ploughed in. Where the crop is grazed, a considerable amount in the fodder eaten by stock is returned to the soil in the solid and liquid excreta. When cut for hay and removed from the field, the combined nitrogen contained in the residues of roots, stubble, and fallen leaves adds materially to the stock of nitrogen in the soil. For soils lacking sufficient of this element, the growth of legumes is frequently the most economical method of making good the deficiency.

The main defects of scarlet clover in rotation for wheat are the slow initial growth, which allows of weeds to develop which may ripen seeds before the clover is fit to feed-off or cut, and the fact that the bulk of the fodder is generally available only in spring, when other foods are plentiful, instead of during the winter when they are scarce. It cannot be compared with rape in covering the ground quickly, as rape smothers weeds, and provides autumn and winter fodder.

When cut for hay, it should be harvested shortly after it blooms. Owing to the hairy nature of the plant, it is credited with forming hair-balls in the stomachs of animals.

One or two of the Medick family, in addition to lucerne, are also of considerable value.

Black Medick.

(Nonsuch Clover; Hop Trefoil; Yellow Trefoil; or Yellow Clover.)

(*Medicago lupulina*).

This trefoil grows well in most soils, and is relished by stock. It is perhaps more adapted to light soils. It is an annual, but it has a procumbent habit, and seeds freely, propagating itself well from seed. The seed-vessels are black when ripe, grow together in clusters; and, unlike the common trefoil, are not injurious to wool. It flourishes in cool districts, and proves valuable for many parts of the tablelands.

Burrless or Hookless Medicks.

(*Medicago orbicularis*, &c.)

These are much of the same nature as Black Medick, but have large, roundish seed-pods entirely without hooks. Like those of Black Medick, these are not injurious to wool. The varieties are well worthy of attention.

Snail Clover (*Medicago scutellata*) has a large, shining, spiral pod without injurious appendages; but it is not so hardy as the common trefoil, and requires favourable conditions.

Burr Medick or Burr Trefoil.

(*Medicago maculata.*)

This is common in many parts of the State. The pod clings to wool by its many hooks, and is very injurious to that product In drought, however, the seeds, which are fattening, are eagerly picked up by sheep. The growth of this variety should be discouraged in favour of those with the burrless pods, as the latter possesses all the good qualities of *M. maculata.*

The Soil.

Clover requires fairly good soil. Those of a clayey nature, such as stiff clays and loams, give good crops; light loams also prove satisfactory. Rich alluvial flats are eminently suitable, and usually give splendid crops. Sandy soils are unsatisfactory, and good crops are rarely obtained from them. An abundance of potash and phosphoric acid encourages its growth, as does also lime. This last is essential as a plant-food, but its chief value to the clover crop appears to be that it increases the amount of soluble potash in the soil. It is noticeable that where lime is applied to clay soils clover appears spontaneously in the pasture. It rarely so appears in sandy soils, except perhaps to a limited extent.

Preparation of the Soil.

The land must be worked down to a fine, level, firm condition. Deep ploughing should be given, and the harrow and roller used until the right degree of fineness is reached. The seed cannot be covered deeply.

Seeding.

When sown alone, about 12 lb. of seed per acre or more should be used. It is rather difficult to sow such small seed by hand, and the machines recommended for sowing lucerne should be used. Clover will not stand the heat of summer, and the sowings must be made so that it will make its full growth before hot weather begins. Sowings can be made from the beginning of March to the end of April, but upon rich soils with good rainfall later sowings will be found satisfactory. The seed should be covered with a light iron harrow or a brush harrow. Rolling is not advisable after sowing, except on very light open soils.

Manuring.

Fairly liberal manuring is required on poor soils. Lime is beneficial, and can be applied at the rate of 1 ton per acre. Wood ashes and gypsum also form good manures; they can be applied at the rate of 10 cwt. per acre.

Nitrogenous manures are not usually required, but in some cases may be necessary. A manure which is usually satisfactory is:—

1¼ cwt. superphosphate } per acre.
¾ ,, sulphate of potash }

The plant should be encouraged to obtain its nitrogen from the air, through the agency of bacteria. At the same time a small amount of nitrogen may be helpful until the plants are able to gather it from the air, and, if desired, half a cwt. of sulphate of ammonia may be applied.

Feeding the Crop.

Clover can be used either as green feed, hay, or pasturage. For green feed or hay it should be cut when about one-third of the bloom is out. The hay is a little difficult to cure, but if the methods recommended for lucerne are followed, good hay will be obtained. Care should be taken in feeding green clover, as it is liable to cause bloating. Stock should be accustomed to it gradually, and given some other feed in addition. Clover hay is equal to lucerne hay, and, like it, improves the feeding value of green maize or silage.

II. VETCHES OR TARES.

This crop is valuable as a green feed for all kinds of stock, and as green manure for maintaining the fertility of the soil. It has long been a favourite soiling crop in England amongst horse-owners, as it is peculiarly suited to the digestive capacity of horses. Like other leguminous crops it is rich in protein, and for this reason is a valuable animal food It is usually cut and fed in the green state, and is seldom used as hay, although it can be well saved in that form. It can be used as pasturage for stock, and when utilised in that way does much to improve the soil in addition to providing feed.

In the colder districts, however, the slow growth of these plants allows of the development of weeds, and they provide but little winter fodder; and if used for green manuring in orchards, they cannot be left until fully developed in the spring, as the plant food would not be available until decomposition, too late for early fruits. A quicker growing crop may be ploughed in during the winter, and hence rye and barley are preferable for orchards in elevated districts.

Vetches are frequently sown in conjunction with oats, barley, or rye to improve the feeding value of the basic crop, and to give greater palatability. The tares climb up the cereals, which act as supports, and both are cut together.

The Climate.

Vetches can be successfully grown over a large portion of the State. The crop grows during the winter season, and requires a fairly good rainfall. The latter is really the controlling factor, and is responsible for the limitation of its growth to the more favoured districts.

Soil.

It requires fairly good soils for its full development. Alluvial flats and the various loams, especially those well supplied with lime, are very suitable. Clay soils give good crops, but sandy soils are not satisfactory. On poor soils, its cultivation can be scarcely recommended, as other more adaptive leguminous crops are available.

Preparation and Seeding.

The soil should be well prepared. Where the crop is grown for green manure in orchards, which have been thoroughly cultivated, or is sown after a fallow, it is only necessary to stir the surface with a cultivator to bring the soil into proper condition, if weeds are not abundant. Land which is in a rough, unprepared state must be ploughed and reduced to a satisfactory tilth with the hoe and roller.

Different methods of sowing are adopted, but the most economical is that of sowing in drills about 2 feet 6 inches apart. Seed is expensive, and when it is sown at closer distances or broadcast, a large quantity is required. By sowing in drills the amount of seed is reduced from 45 lb., required in broadcasting, to 7 lb., as drill sowing allows of fuller development of the plants. Cultivation can also be given between the rows to check the loss of moisture by evaporation, and a better crop is obtained should adverse weather conditions prevail.

When vetches are sown with a cereal, such as barley or oats, half a bushel of vetches and one bushel of the cereal are sufficient per acre. The seed can be mixed together and sown broadcast or with the wheat drill.

Manuring.

Vetches make demands very similar to clover upon the soil, and practically the same manures are needed. The crop is frequently grown for green manure. Under such circumstances it is advisable to encourage as great a growth as possible. Manures can often be more effectively used by applying them to the green manure crop than to the main crop, because of the large amount of organic material which becomes available for incorporation with the soil, while at the same time the actual plant-food is returned.

Varieties.

The chief kinds are the Black and Golden vetches or tares. The two are very similar in growth. They grow more rapidly than the other varieties, and are the most suitable when the land is only available for a short period.

The Hairy Vetch is a more vigorous variety, but it must be planted very early, otherwise it makes little growth during the winter months. It occupies the land for a long period, but gives a much heavier yield than the other varieties, and resists drought well. When used as a green manure crop it should be ploughed in before seed is produced, as self-sown plants may give trouble later. It is remarkably hardy, but ripens its seeds over a protracted period, which interferes with harvesting them, and enhances the price of the seed.

DO SOILS BECOME EXHAUSTED ?

"THE theory seems to have been in times past that soils become exhausted by constant cultivation; but the result in Europe, where acres under constant use for producing crops for ten centuries are made now to produce crops three times those of this country, shows that there is nothing in this theory, and that successful farming can be continued on land long in use, and that great crops can be raised and garnered from it if only it be treated scientifically and in accordance with its necessity."—President Taft, at National Conservation Congress, Kansas City, U.S.A., 25th September, 1911.

Composition and Feeding Value of Maize.

F. B. GUTHRIE, Chemist.

SOME analyses which have been made in this laboratory of different varieties of maize may be of interest to maize growers, and to those using maize as part of the ration for stock. The bulk of the samples are from farms on the South Coast, a few others being added for the sake of comparison. Table of analyses is given on page 340.

It will be seen that there is a very close similarity in the composition of the different varieties; and their feeding values, whether calculated on the original sample or to dry substance, show no striking differences. It would seem, therefore, that attempts to increase any particular constituent, such as albuminoids or fat, by cross-breeding, would not be likely to meet with the same measure of success as has attended similar attempts at improving sugar in the sugar-beet or gluten in wheat.

The results also show that there is no justification on the ground of feeding value for the prejudice against white maize as compared with yellow, the white variety having practically the same feeding value. It is rather lower in oil or fat than the yellow sample from Tenterfield, with which it was compared, but is higher in nitrogenous matter and starch. The oil content is, however, higher than in several of the South Coast samples.

In the same way there is little or no difference between the bulk maize imported from Argentina and the Northern Rivers bulk maize.

TESTING SAND FOR CONCRETE.

THERE is often doubt as to whether sand which is available is suitable for making concrete. In Farmers' Bulletin No. 461 of the United States Department of Agriculture—" The Use of Concrete on the Farm," it is stated that sand which will pass through a screen with 40 meshes to the lineal inch is generally too fine for concrete work. It may be necessary to screen out this fine sand. Coarse sand gives stronger concrete, but it is stronger still if it contains grains of various sizes from one-fortieth to a quarter of an inch. The following hint is given :—

> The coarseness of the sand can be felt, or can be determined by a screen, and the vegetable matter can be seen, but the amount of clay or loam cannot be decided in either of these ways. Four inches of sand should be put in a pint preserving jar, and, when the jar has been filled with clear water to within an inch of the top, the lid should be fastened on and the jar shaken vigorously for ten minutes. The jar should then be rested upright, and the contents allowed to settle. The sand will settle in the bottom with the clay and the loam on top, and the water above them. If more than one-half inch of clay or loam shows, the sand should be rejected or washed. The difference in colour and fineness shows clearly the line of division between the clay or loam and the sand.

TABLE OF ANALYSES OF SAMPLES OF MAIZE.

	NINE SAMPLES OF MAIZE FROM SOUTH COAST.									FOUR OTHER SAMPLES FOR COMPARISON.			
GROWER:—	E. Evans, Dapto.	J. A. Brown, Yallah.	W. J. Smith, Dapto.	W. Harris, Dapto.	E. Evans, Dapto.	John Brown, Brownvale	E. Evans, Dapto.	E. Evans, Dapto.	J. Lindsay, Dapto.	White Maize, Tenterfield.	Yellow Maize, Tenterfield.	Argentine Maize.	Bulk Sample of Northern Rivers Maize.
VARIETY:—	Boone County Special.	Boone County Special.	Early Leaming Hybrid.	Early Leaming.	Golden King.	Golden King	Yellow Dent Hybrid.	Red Hogan.	Yellow Hogan.				
	per cent	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent	per cent.	per cent.	per cent.	per cent.	per cent.
Moisture ..	15·28	15·16	17·42	13·55	18·68	20·29	17·02	13·11	16·27	12·72	12·75	12·07	11·36
Albuminoids ...	9·94	7·63	8·25	9·19	8·75	7·56	7·63	7·81	8·38	10·99	11·37	10·13	10·06
Ether extract ..	4·13	4·41	4·48	4·55	3·19	3·40	3·03	4·69	4·44	3·51	4·60	4·47	4·57
Fibre ...	1·24	1·43	1·47	1·42	1·13	1·02	1·47	1·30	1·34	1·61	1·48	1·54	1·53
Ash	1·44	1·45	1·18	1·15	1·34	1·24	1·31	1·36	1·35	1·39	1·27	1·35	1·32
Carbohydrates ..	67·97	69·92	67·20	70·14	66·91	66·49	69·54	71·73	68·22	69·78	68·53	70·44	71·16
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Nutritive value ..	87·2	87·5	85·5	89·6	82·8	81·7	84·0	89·7	86·6	89·5	91·4	9 ·6	91·5
Calculated to Dry Substance.													
Albuminoids ..	11·73	8·99	9·99	10·63	10·76	9·48	9·20	8·99	10·01	12·59	13·03	11·52	11·35
Ether extract ...	4·88	5·20	5·43	5·27	3·92	4·27	3·65	5·40	5·30	4·02	5·27	5·09	5·15
Fibre	1·46	1·69	1·78	1·64	1·39	1·28	1·77	1·50	1·60	1·85	1·70	1·75	1·73
Ash	1·70	1·71	1·43	1·33	1·65	1·56	1·58	1·56	1·61	1·59	1·46	1·54	1·49
Carbohydrates	80·23	82·41	81·37	81·13	82·28	83·41	83·80	82·55	81·48	79·95	78·54	80·10	80·28
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Nutritive value ...	102·9	103·1	103·6	103·6	101·9	102·5	101·2	103·7	103·4	101·6	103·4	103·1	103·2
Albuminoid ratio ..	1:7·8	1:10·5	1:9·4	1:8·7	1:8·5	1:9·8	1:10·0	1:10·5	1:9·3	1:7	1:7	1:8	1:8

F. B. GUTHRIE.

A New Lucerne Trouble.

DOWNY MILDEW (*Peronospora trifoliorum*, De Bary.)

[THIS fungus disease has not been recorded in New South Wales, but has appeared in Victoria. In order that farmers may be placed on guard, we republish the following notes by Mr. C. C. Brittlebank, Assistant to the Vegetable Pathologist, which appeared in the *Victorian Journal of Agriculture* for January, 1912.]

SOME crowns of lucerne were recently forwarded to the office of the Vegetable Pathologist for examination, and were found to be affected with Downy Mildew. As this disease is evidently a recent introduction, the following notes will be of interest :—

Peronospora trifoliorum is a common parasite on various legumes in America and Europe, and in the former country there is record of damage to lucerne by this pest. Until the specimens under notice came to hand there was no record of it for Victoria.

As this fungus belongs to a genus, many of which are destructive to cultivated plants, it behoves the growers of lucerne, especially in irrigation areas, to be on watch, lest their crops be invaded by this pest; if once established, it would be most difficult, if not impossible, to exterminate. It is spread not only by conidia, which are blown from plant to plant, but also by oospores or resting spores formed within the tissue of diseased leaves. The latter, falling into the crowns of the plants and on to the soil, serve as fresh sources of infection, from which the disease spreads during the following year. Even if the lucerne be eaten down to the crowns by sheep or other stock, a certain number of fallen leaves would be trodden into the soil, and start the disease afresh in the following spring.

Although only a few specimens of this disease have been brought under notice, and probably but few lucerne growers have seen it up to the present time, it does not follow that the disease is of no economic importance. Until a few years ago, the Lucerne Rust had not been observed in Victoria; the first specimens obtained were found by the writer on the railway embankment at Garden Vale, near Melbourne. At the present time, many parts of the State are infested by this disease, and tons of valuable fodder are destroyed every year. Lucerne rust was, without doubt, imported with consignments of seed from other countries, as in nearly every shipment of lucerne seed spores could be obtained in abundance. Most probably, the resting spores of the downy mildew of lucerne have reached Victoria in fragments of diseased leaves, mixed through shipments of seed.

General Appearance of Diseased Plants.

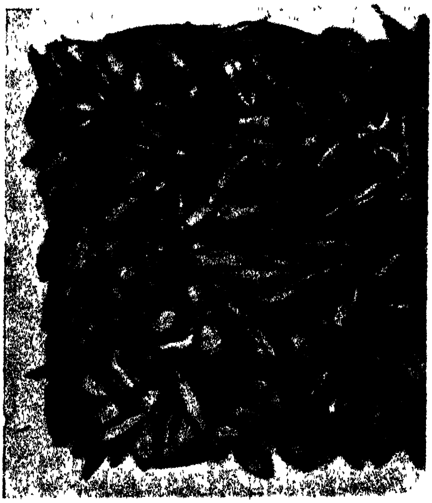
The specimens under notice had a stunted and unthrifty look, the upper portions of the stem and leaves being covered by a thick greyish or violet-grey downy layer. Many of the diseased leaves were coated on both surfaces, and had their edges curled downwards and inwards towards the mid-rib. Others again, were of a yellowish grey, more especially those exhibiting the downy coating on the under side only. Several of the stalks were almost bare of leaves on their lower portions, and clearly showed the disastrous effects of the disease.

If a small portion of the grey felted coating be mounted for examination by the microscope, it will be found to consist of minute tree-like structures, bearing, at the tips of the many forked branches, oval egg-shaped bodies known as conidia. These minute bodies are capable of infecting any lucerne or clover plants on which they may fall, weather conditions being favourable.

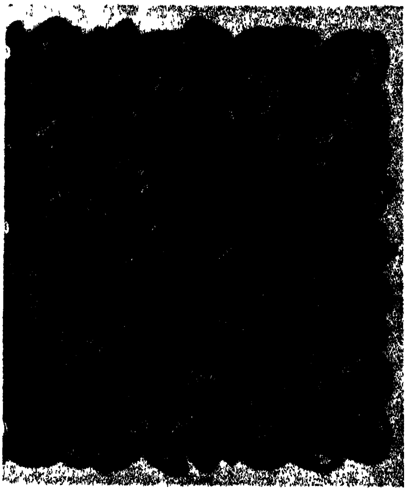
If small patches only of the field be attacked, they should be at once covered with straw and burnt over to destroy all diseased plants and fallen leaves. By taking this precaution, it is possible that the disease may be arrested in its destructive course.

As irrigation colonies become more numerous, so will the conditions be more favourable to the spread of various diseases—warmth and moisture constitute suitable conditions for the development of fungoid pests. Settlers should, therefore, be continually on the lookout for the appearance of any disease such as the one under review.

The Grader and the Black Oat.



"OATY" SEED WHEAT
BEFORE GRADING



THE SAME SEED WHEAT
AFTER GRADING.

CLEAN, GRADED SEED WILL KEEP YOUR PADDOCKS CLEAN.

DEPARTMENT OF AGRICULTURE.
N.S.W., APRIL, 1912

Export of Potatoes and Onions to Manila, Philippine Islands.

In November of last year, Mr. John McFarlane, M.L.A., presented a letter from the King's Creek (Lawrence) Branch of the Farmers, Producers, and Commercial Union, urging the Minister of Agriculture to make an effort to secure the contract of supplying the United States Army at Manila with potatoes, and stating that this would have a tendency to prevent the great fluctuation in prices.

So far as the production of potatoes in this State is concerned, it may be noted that in 1909, 12,860 cwt. were shipped to the Philippine Islands, none of which were grown in the State, the value of same being £4,364. The area under crop for that year in New South Wales was 26,301 acres, which produced 1,435,880 cwt., valued at £275,340; and during the same year we imported 927,244 cwt., valued at £237,541. We exported 188,602 cwt., valued at £51,812. The net imports were therefore 738,642 cwt., valued at £185,729, leaving the actual consumption for the State at 2,363,124 cwt., valued at £461,069.

In 1910 the State produced 2,002,860 cwt., valued at £400,570, and up to 13th September imported 798,428 cwt., valued at £219,999. The exports for the year were 83,533 cwt., valued at £26,048. As the full figures regarding the imports for the year cannot be given, it is impossible to say what the State's actual consumption was, but certainly it was considerably in excess of the State's production.

It will be seen that the State does not yet produce sufficient potatoes for its own requirements; however, inquiries were made from Mr. J. B. Suttor, Commercial Commissioner for New South Wales in the East, as to the quantity of potatoes contracted for by the authorities at Manila; what period the contracts cover; and as to the prospects of a trade in fresh potatoes as well as preserved potatoes.

Writing on 28th December, Mr. Suttor says that the contracts for the supply of potatoes to the United States Army at Manila are divided into periods of four months each, viz., March to June, July to October, and November to February. In a later report of 11th January, 1912, Mr. Suttor forwards the following clipping from the *Manila Times* of 26th December 1912:—

ADVERTISEMENT.

Proposals for Fresh Vegetables.—Headquarters Philippines Division, Office Depôt Commissary, Manila, P.I., December 20, 1911. Sealed proposals in triplicate, subject to usual conditions, will be received at this office until 11 o'clock a.m., January 30, 1912, at which time and place they will be opened in the presence of attending bidders for furnishing and delivering to the Subsistence Department, U.S. Army, Manila, P.I., such quantities of fresh potatoes and onions as may be required from time to time during period from March 1, 1912, to June 30, 1912. About 600,000 pounds potatoes, and 120,000 pounds onions will be required per month. Each proposal must be accompanied with a bidder's guaranty in the amount of $5,000.00 or with certified check for that amount on a bank of approved standing in Manila. The bidder to whom award is made will be required to give bond, the penalty of which will be fixed by the Depôt Commissary. Blank forms, specifications, and all necessary information can be obtained on application to this office. Envelopes containing proposals should be marked "Proposals for Fresh Vegetables, to be opened January 30, 1912," and addressed to the undersigned.—ALEX. M. DAVIS, Major, Commissary, U.S. Army, Depôt Commissary.

[Dec. 21-22-23-26, Jan. 27-29.

It will be seen that tenders closed on 30th January for supplies covering the period for deliveries from 1st March to 30th June, 1912, and as the contracts are for periods of four months each, Mr. Suttor assumes that the next tenders will close about 30th May and 30th September. The quantities asked for were 600,000 lb. of potatoes, and 120,000 lb. of onions per month. In addition to the army supplies, tenders for half-yearly contracts are usually invited about December and June for the constabulary and Bureau of Prisons. Mr. Suttor cannot give the exact quantities just now, but has promised to obtain further particulars. Meanwhile he gives the following particulars showing imports of vegetables, &c., for the year ended 30th June, 1911 :—

	Kilos.	£	s.	d.
Potatoes	8,979,769	39,404	7	6
Onions	4,491,191	21,961	5	0
Canned Vegetables	......	36,438	15	0
Beans and Peas	1,872,201	18,405	0	0
All other, including Pickles and Sauces...	......	30,625	0	0
		£146,834	7	6

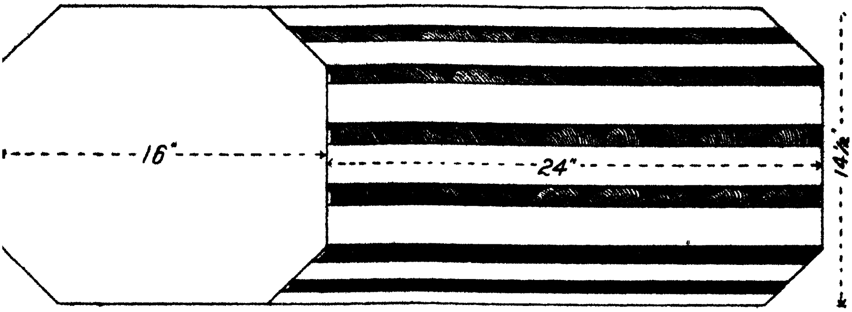
Of the above, Australia supplied as follows :—

	£	s.	d.
Potatoes	7	1	8
Onions	5,168	6	8
Canned Vegetables	5	4	2
Beans and Peas	Nil.		
All other, Sauces and Pickles	543	6	8
	£5,723	19	2

Mr. Suttor concludes with the following remarks, which should prove valuable to anyone contemplating this trade :—

The importation of our New South Wales potatoes, onions, &c., to the Philippines is a matter to which I have frequently drawn attention. With care, there is no reason why we should not control the market, more especially in regard to potatoes, and with this object in view I induced one of the leading importers to visit Sydney about September last. As a result, I hope to see a considerable improvement.

For the Manila market, potatoes and onions are done up in crates of about 24 inches by 14½ inches, and contain 100 lb. of potatoes, or about 90 lb. of onions, the crates being as per sketch.



Crate for shipping Potatoes or Onions to Manila.

In potatoes and onions, for the year ended 30th June, 1911, the bulk of the business was done by Japan. In canned or preserved vegetables the market is so far in the hands of the Americans, Spain, Belgium, France, and China; but with care and attention there is no reason why we should not participate to a greater extent.

In connection with any desired participation, more especially for the Army, or Government contracts, the business can only be satisfactorily done through local agents at Manila, and this I would strongly advise, for obvious reasons, any of our New South Wales people to recognise.

"WHEAT-GROWING IN CANADA, THE UNITED STATES, AND THE ARGENTINE."

By W. P. Rutter, M. Com. Manchester University; London, Adam and Charles Black, 1911.

THIS compilation was submitted in July, 1910, for the Degree of Master of Commerce of the Manchester University, and was recommended by the examiners for publication. The author has quoted freely from standard works, and has also obtained statistics and other information from the Agricultural Departments of the several countries.

The book is a comprehensive and scholarly survey of the present and future position of wheat-growing in North and South America, dealing with soil, climate, varieties, cultivation, harvesting, yield, cost of production, transportation, storage, marketing, prices, and probabilities of the future. All of this interests our farmers and grain merchants, and the book is well worth reading. Our position in the world's wheat game is not dealt with, but it is an advantage to know the other fellow's cards; and the book makes it clear that Canada has a handful of strong trumps. Still, the reader feels that it would have been to our advantage if Australia had been included in the scope of the work. For instance, there is a quotation from Professor Brewer's Report on Cereals in the Tenth United States Census, giving the climatic conditions for winter wheat:—

> The ideal climate is one with a long and rather wet winter, with little or no frost, prolonged into a cool and rather wet spring, which gradually fades into a warmer summer, with only comparatively light rains after the flowering of the crop, just enough to bring the grain to maturity, with abundant sunshine and rather dry air towards the harvest, but without dry and scorching winds until the grain is fully ripe, and then hot, dry, and rainless weather until the harvest is gathered.

That is the climate of Riverina.

The Peach.

[Continued from Page 68.]

W. J. ALLEN.

DISEASES AND PESTS.

THE following notes on the diseases and pests of the peach have been compiled from our booklet on "Insect and Fungus Diseases of Fruit-trees," from the spray leaflets issued by the Department, and from *Gazette* articles by several officers. An attempt has been made to co-ordinate the information and bring it up to date, so that when this series is published in separate form, the growers may be able to recognise the more common troubles and combat them.

Insect Pests.

Peach Aphis—(*Aphis persicæ-niger*, Smith)

This is one of the most serious pests that the peach grower has to deal with in the spring, when the trees are just coming into leaf, and if neglected may cause the loss of all his crop, the young branchlets becoming curled and twisted from the infestation, while frequently many of the nursery seedlings and stocks are killed.

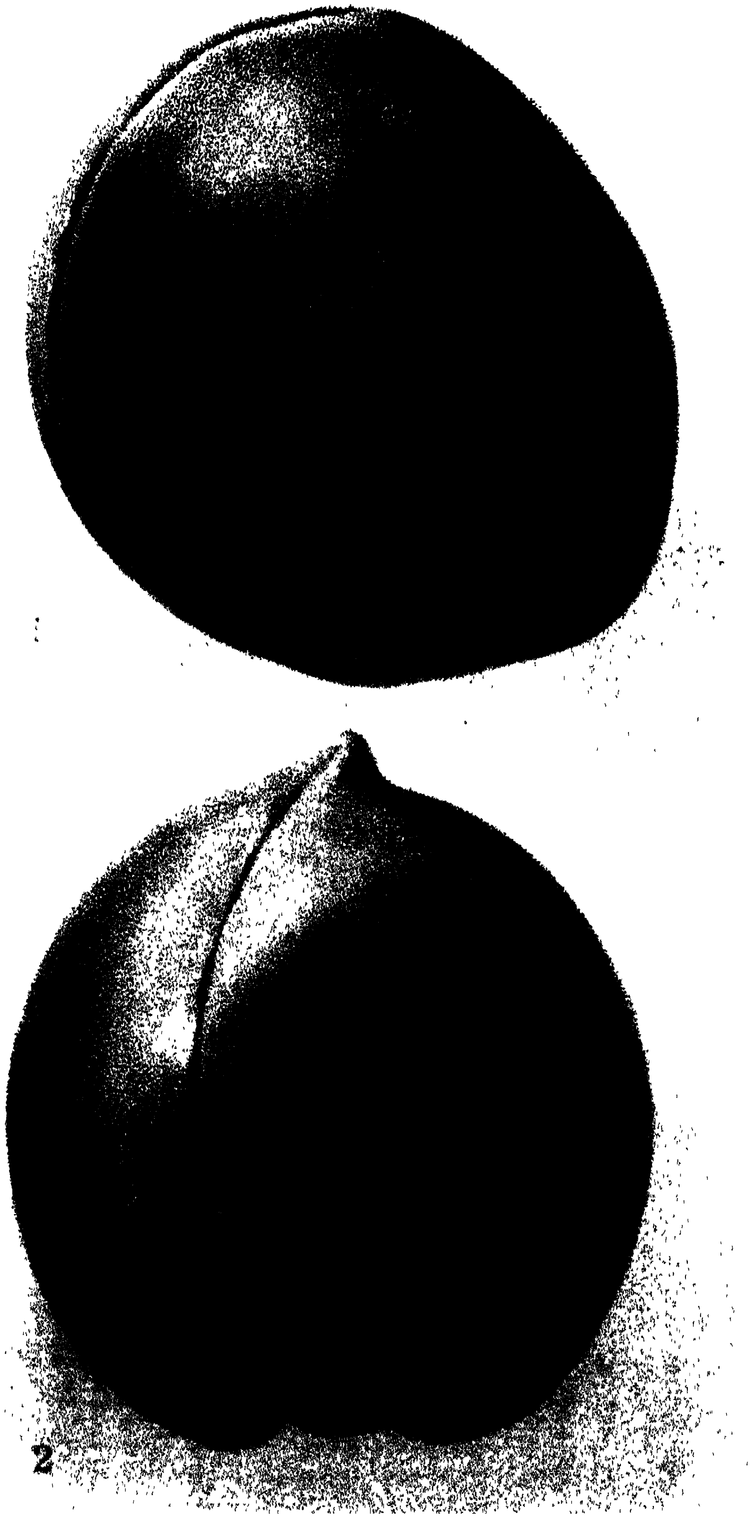
It is common all over Australia.

Description and Life-history.—These insects are almost too well known to need description. They are of a dark-brown to nearly black colour when adult, smooth and shining. The young ones are lighter coloured, with the eyes and nectaries black. Some of the females are winged, and they all cluster together round the buds and young shoots of the plant.

They winter upon the roots of the trees, crawling up in spring, but even as early as July some will be found on the underside of the lower branches and suckers. They feed in the same manner as the scale insects, piercing the bark with their sharp tubular mouths, and sucking up the sap of the tree, multiplying with such rapidity that by the time the leaf-buds and flowers burst out the trees look as if they had been dusted with lamp-black. If neglected at this time, the aphis may cause the young fruit to fall.

Where this pest has been neglected, the orchards looked as if they had been scorched with a hot wind; but where sprayed in time the crop may be saved, and the foliage appear of a normal green colour.

Treatment.—The first plan to check the aphis is to attack the winter broods upon the roots, which can be treated with waste tobacco in the same manner as the American blight upon the apple-trees.



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Watch the trees, and as soon as the first winter broods of aphis are found upon the branches, spray with one of the following.—

Spraying.—(1) Tobacco Wash—

Directions for Making Tobacco Wash.

Formula :—Waste tobacco, 2 lb.
Soft soap, 1 lb.
Water, 6 gallons.

Steep the tobacco in a bucket with about 2 gallons water, and let it stand overnight. Strain it in the morning, adding the soft soap and the rest of the water warm. Spray on warm. Give two or three applications if the aphis still appear. The nicotine of the tobacco kills the aphis, the soap assisting to make it penetrate and stick. This wash will not injure the most delicate foliage upon young peaches.

(2) Resin and soda wash—

Dissolve 3 lb. of washing soda and 4 lb. of finely-powdered resin over a fire, in about 5 pints of water; then add water to make 5 gallons. Boil well till the resin is thoroughly dissolved, and the mixture is of a dark-brown colour, and then take 1 gallon of the mixture to 7 gallons of water, and apply hot.

(3) Sunlight Soap Wash—

Dissolve a cake of Sunlight soap in 2 gallons of water, and spray when warm. This is easy to mix, and has given satisfactory results in destroying this pest, and the wash will not injure the blossom, consequently the trees can be sprayed at any time. It is not safe to use other sprays when the trees are in bloom.

The above solutions kill by contact, and therefore the application should be very thorough. It is often found necessary to make two or more applications for this pest.

When to Spray.—As soon as the winter brood is detected, prune the trees and burn all prunings, after which the first spraying should be given, followed by others at intervals of a few days, until the trees are rid of the pest.

At our Wagga orchard we have found that 1 gallon of kerosene diluted to 45 gallons of water, to which has been added the strength of about 6 lb. of steeped tobacco-stems, effectually killed this pest. McDougall's Insecticide is also an excellent remedy.

The Mediterranean Fruit-fly—(*Ceratitis capitata*, Weidman).

Though the Queensland fruit maggot fly is common in peaches from the northern parts of this State, it is the above species which has been introduced from Western Australia, that is by far the commonest in the districts round Sydney.

Description and Life-history.—The fruit is pricked by the ovipositor, and the eggs deposited in the same manner beneath the skin, and in their larval and pupal state their habits are identical; the only difference is that in the latter the pupal case is more rounded and lighter in colour.

The perfect insect is a handsome little two-winged fly, with a body measurement of about 2 lines, and across the outspread wings about 4 lines. It is smaller than the Queensland fruit-fly, and much more brightly coloured; the eyes, in particular, have rich metallic tints; the back is grey marbled with black, with the body broad behind, but sharply pointed towards the tip, of a general dark yellow banded with brown; the wings are richly tinted with both a transverse and parallel band of dull yellow, while the basal portion of the wing is very daintily marbled with grey and black.

Curious horns ending in a spoon-shaped club that project on either side above the eyes are found on the male.

Treatment.—All fallen and infected fruit must be gathered and destroyed by boiling or burning (according to fruit pest regulations). Shallow tins containing a small quantity of kerosene hung in the trees are effective in trapping numbers of flies.

Rutherglen Bug—(*Nysius vinitor*, Bergroth).

Description and Life-history.—Small plant bugs, which every few seasons appear in great numbers among the weeds and rubbish in the fields, and when fully developed attack the fruit, pricking it with their sharp beaks, and causing the fruit to become spotted, and finally fall to the ground. These bugs are small creatures, about 1½ lines in length when full-grown, of a general greyish-brown colour; the eyes large and rounded; the forehead rather pointed; and the antennæ long, composed of four joints, the basal one short and thick; the thorax is narrow behind the eyes, but broader at the base of the wings; the legs long and slender, with the tarsi rather black; the wings are semi-transparent, with a few dark lines showing when closed.

They are very active little creatures, more particularly on bright warm days. When disturbed in weeds, vegetables, or fruit-trees, they run to shelter, or take to the wing so readily as to suggest flies. They are, therefore, difficult to get at with sprays, numbers escaping on the wing. Little is known of their early stages, but they seem to lay eggs close to the ground on weeds and grass. Besides fruit, they attack tomatoes, potatoes, strawberries, and other crops. The effect of the punctures by their sucking beaks is to cause spots and discoloration of the fruit, spoiling their appearance for the market, and also for preserving purposes.

Treatment.—Burn or plough in weeds, &c., in or around the orchards which harbour the eggs and young stages, and tide over eggs and adults during the winter months. In potato and other crops they are lessened by beating the rows on either side and driving the bugs into shallow trays of oil drawn up and down between the rows. Similarly, in the early morning when the bugs are much less active, jarring the branches over a sheet causes hundreds to fall each time, and these are collected in the sheet and emptied into a bucket of oil or tar. The numbers of bugs may be much reduced by this method, though hardly practicable over large orchards. Spraying with tobacco wash or weak kerosene emulsion in early morning, while the insects are sluggish, may be recommended.

The Brown Olive Scale—(Lecanium oleæ).

The Entomologist reports this scale to be very common upon peach and apricot trees in the Wollongong district, the young wood at the tip of the branches being covered with the shells of dead scale, and the stems dark and smutty in July; but as very few young live scale could be found upon the branches, it may be only an occasional habit of this scale.

Treatment.— Red Oil Emulsion (*see* below).

San José Scale—(Aspidiotus perniciosus, Comst.).

Perhaps no fruit-tree shows the attacks of this scale so rapidly as the peach. When badly infested the green young wood becomes blotched and stained red, and frequently becomes distorted with the numerous depressions caused by the scales. The young wood dies back from the tips, and if neglected the tree will perish in a year or two.

Hundreds of peach-trees have died in this State from the attacks of the coccid.

Wherever the scale attacks the fruit it causes the same bright red stain that it does upon the apple and pear.

Treatment.—Lime-sulphur; Red Oil Emulsion. Applied when the trees are dormant, or just before the buds begin to swell.

RED OIL EMULSION.

Winter Wash.—Contact Insecticide for Woolly Aphis, Mussell Scale, San José Scale, and Red Mites.

Add 2 lb. of soft soap to 1 gallon of soft water, and boil until dissolved, after which add 2 gallons of red oil and bring to a boil. Emulsify by either stirring rapidly, or by placing the nozzle of a spray-pump in the mixture and pumping quickly for a few minutes uutil it emulsifies. Dilute in the proportion of 1 in 30, or make the whole up to 60 gallons.

When first made it looks something like cream. The strong emulsion should first be placed in the spray-barrel, and then the required amount of water for diluting added.

When the weather is very cold the water for diluting should be warmed; otherwise the mixture is liable to turn into a jelly.

In applying this solution through the pump, considerable force must be used, so as to ensure the mixture reaching into all crevices where the insects might be sheltering; and see that every part of the tree is covered, as if even a few are missed, they breed very rapidly. If any live ones are found on the tree after this treatment, it may receive another spraying, or, if only a few are found, the infested parts may be painted with the emulsion, using a brush for the purpose.

Care should be taken in mixing to see that the oil does not come in contact with the fire, and the work is done in the open to prevent any possible chance of setting fire to buildings.

Spray-pump and hose should be well rinsed in hot water directly after being used, as the oil attacks the rubber.

When to Spray.—The above wash should be applied as late as possible before buds start.

The Chaff Scale—(*Diaspis amygdali*, Tryon).

Description and Life-history.—This is a common coccid upon the peach and one or two other fruit-trees in the northern districts of this State and Southern Queensland; and when a tree is badly infested a great deal of the smaller wood is killed, and the tree greatly damaged. They cluster so close together that they often overlap like the slates on the roof of a house. The female coccid is bright orange red, covered with a white circular scale, with the central exuviæ brownish-yellow, which is finely ridged; the scale itself is convex, and not unlike the well-known Rose Scale (to which it is closely allied).

The scale of the female coccid is of the same colour, but is very small, the general form elongate and narrow, three times as long as broad, with a ridge down the centre through the exuviæ to the tip. This scale has a very extended range in America, where it is known as the "White Peach Scale," and is also found in Japan and South Africa.

Treatment.—Spraying with Resin Wash; Red Oil in winter; or Lime-sulphur.

White Ants—(*Coptotermes lacteus*, Froggatt).

When the peach-trees get old, and decay sets in about the roots or main trunk, if there are any white ants in the vicinity they will find their way into the trunk and soon gnaw the centre out, gradually extending their passages up the main branches, and when a heavy wind-storm comes it is no uncommon thing to see half-a-dozen large trees minus a limb or two. This is the species that is always found at this work in the neighbourhood of Sydney, and the soldier can always be easily identified by its smooth scythe-like untoothed jaws, with the curious habit of ejecting a globule of milk-like fluid from a chamber in the front of its head, as a means of defence when captured. The winged or perfect form of this species is a slender chocolate-coloured insect, with slender, rounded, blackish wings.

Treatment.—Cut out all dead branches or dead wood at the roots, and treat with tar-water; burn all dead wood or stumps near the trees, which are only likely to harbour the white ants. Above all, endeavour to find and destroy the permanent headquarters or nests, with the queens. Egg-laying is then over, and the white ant colony will speedily perish, there being no young ones to replace the mature ones as they die.

Dig in several pounds of Kainit above the roots of infested trees.

The Yellow Peach Moth—(*Conogethes punctiferalis*, Gu.).

Description and Life-history.—This moth lays her eggs upon the half-grown fruit. The grub hatching out gnaws its way into the centre, feeding round the stone until nothing but the skin is left, covered with a web and castings upon the side it has entered. When full grown it generally gnaws a hole in the side of the stone, and pupates in the cavity thus formed, protected by the shrivelled skin of the peach.

The moth measures an inch across the expanded wings, and is of a general rich yellow colour, thickly mottled with fine black spots that form a number of irregular transverse lines towards the tips, but are more indistinct and broken near the body, which, as well as the thorax, is also spotted.

The presence of the grub can be detected by the web and mass of castings hanging round the hole. As soon as a withered peach is noticed it should be pulled off and destroyed before the creature has had time to pupate and emerge as a perfect moth. This is a common pest in Queensland and the northern parts of this State, where at times it does considerable damage.

Cicadas—(*Cicada angularis*, Germ., and *Cyclochila australasiæ*, Arayot).

Description and Life-history.—Specimens of the upper branches of peach-trees are frequently sent to the Entomologist with rows of longitudinal slits running down the back so close together that the whole surface is rugged and roughened until it looks more like a pine spray than the twig of a fruit-tree. These curious slits are caused by cicadas (popularly known as locusts) visiting the trees at night to deposit their eggs in the woody tissue. Each of these slits, if carefully examined, will be found to contain a double row of elongate, horn-coloured eggs, averaging about sixteen in each slit.

As soon as the young cicadas, which are like little black fleas, emerge from the eggs, they cast themselves on to the ground and crawl down the roots of the trees. The injury above mentioned is only local, and does not go further than disfiguring the wood.

Treatment.—Cut out all disfigured wood.

The Rice Weevil—(*Calandra oryzæ*, Linn.).

It is a remarkable fact that these little grain weevils upon occasion have taken to feeding round the base of fruit where it is attached to the stalk, and causing many of the fruit to drop off before they are ripe. They then crawl in and feed round the stone of the peach, soon causing it to rot. The Entomologist has found them commonly upon the late peaches in the gardens round Sydney. In the first instance they do not appear to eat anything but the woody tip of the stalk, but, if the peach is at all open, they feed readily upon it.

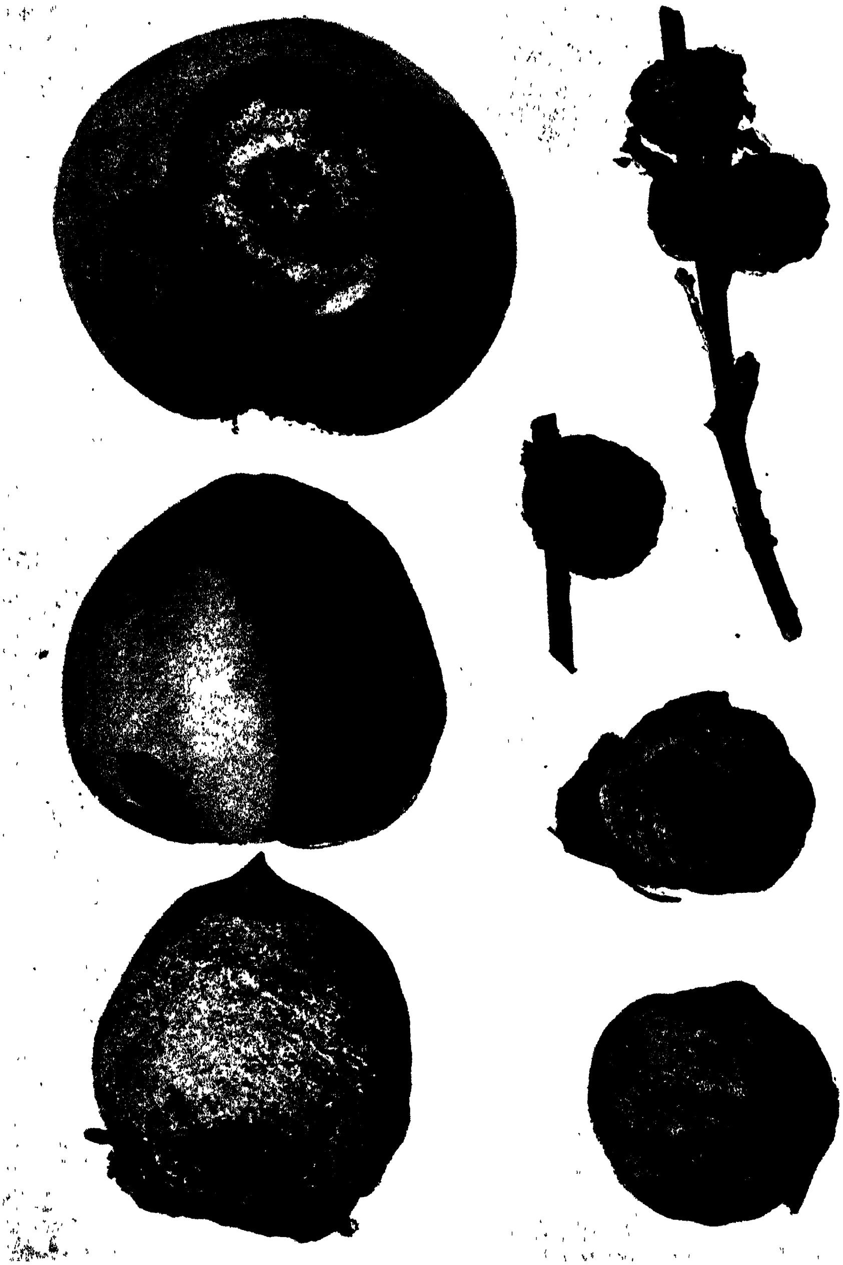
Treatment.—Wheat, maize, and other grain are the common food of this weevil. Infected grain should be fumigated in bins. This grain weevil flies very well, and its breeding-places are corn or grain of some kind.

Fungus Diseases.

Brown Fruit Rot—(*Monilia fructigena*, Pers.).

[T. HARVEY JOHNSTON, *Gazette* March, 1910.]

The Brown Fruit Rot is produced by a fungus, *Monilia fructigena*. This parasite occurs on the following fruits in New South Wales, viz.:—Peach, nectarine, European plum, Japanese plum, apricot, cherry, apple, and pear, especially on the first four named.



Brown Rot (*Monilia fructigena*).

Peaches and Nectarines showing progressive stages in the development of the disease. The "mummified" nectarines are shown in the upper right-hand figures

The accompanying photographs show the typical appearance of peaches and nectarines suffering from this disease. The affected part becomes brown and softened and soon rots. On the surface there appear more or less concentric areas covered by a greyish substance which, under the microscope, is seen to be made up of the spores (*conidia*) and spore-bearing organs (*conidiophores*) of the fungus. In a very short time the whole fruit becomes affected, but instead of falling from the tree, as is usually the case with dead fruit, it may remain on the tree, becoming shrivelled up to form what is popularly known as "mummy fruit." This appears as if it had been dusted with ashes, owing to the abundant formation of spores. Several such mummified nectarines are shown in the photograph.

If the "flesh" of the diseased fruit be examined microscopically, there will be seen abundant fungal threads (*Mycelial hyphæ*) penetrating the cells. It is this mycelium which, at points along the surface, pushes its way into the air, where it forms branched conidiophores capable of giving rise to the spores. These spores become dispersed by insects and especially by wind and rain. They are able to reproduce the fungus, and germinate very readily in water or in the juices of the fruit. Any kind of wound, even an insect puncture, may afford an opportunity for the germinating spore to infect the part. No doubt warm moist weather over our coastal districts has produced favourable conditions leading to epidemics of this fungus. The brown rot readily extends in ordinary storage from diseased to sound fruit, owing to the surroundings being favourable for its development. The affected fruit may "nest" together; hence the importance of eliminating those which are unsound.

The twigs are also attacked, consequently the name "twig-blight" is often given to this disease. Such blighted parts of the tree bear little or no fruit, and gumming often occurs, allowing of the entry of other organisms. These may accelerate the death of the affected part, and the formation of a canker frequently results.

From what has been said above, it will be seen that the removal and destruction, by burning, of all diseased fruit and twigs should be carried out. It has been recommended that trees should be sprayed with dilute Lime-sulphur (if weather conditions are favourable to the fungus), in early spring while the foliage is still young and the blossoms not yet open, and again just after the fruit has set.

Bordeaux Mixture for Fungus Diseases.

Directions for preparing Bordeaux Mixture.

Formula :—	Copper Sulphate (bluestone)	6 lb.
	Lime	4 lb.

Made up with 22 gallons water for winter use, and 50 gallons water for summer use.

Copper Solution.

It is immaterial whether hot or cold water be used to dissolve the bluestone. If the mixture is to be made in a hurry, it is best to boil the copper sulphate in water. If there is plenty of time use cold water; but in this case the bluestone must be suspended in a porous bag (bit of muslin or sacking) as near the surface of the water as possible. If the bluestone is thrown into the vessel, and water poured on the top of it, it will not dissolve in a week. When suspended as described, it should dissolve in about twenty-four hours.

The bluestone solution when made must be diluted largely before the lime solution is added to it. This is a very important point. If the copper solution is too strong, the precipitate formed is thick and heavy, and liable to clog the nozzle of the spray-pump. If the copper solution is made by dissolving the bluestone in a small quantity of hot water, this point is of special importance, and the solution must be largely diluted before adding the milk of lime.

When to Spray.

For the many fungus diseases of the different fruits it has been found that the first application should be given as the buds are bursting in the spring.

If necessary, spraying may be repeated when the fruit has set, and a third application fourteen to twenty-one days later, according to season, should be found effective.

Lime.

The lime, which should be freshly burnt, is slacked with a small quantity of hot water. If the lime is good it should become hot, crack asunder, and give off a quantity of steam, finally crumbling into a white powder. The success of the mixture depends to a great extent on the manner in which the lime is slacked. The common fault observed in practice is the addition of too little water, which results in the development of too much heat and the burning of the lime. In this case there are many small lumps that do not completely slake, and will be thrown out when the lime is strained into the spraying vat. Lime should have constant attention during the process of slaking; water should be added in small amounts as needed to keep the action even and to ensure perfect slacking.

Mixing.

The mixture must be made by pouring evenly into a third vessel the milk of lime and copper sulphate solutions. It is best to strain the materials when pouring them together. It is important that practically equal amounts of the two solutions are poured together at the same time. Do not pour the copper sulphate into the milk of lime, or *vice versâ*, but both together into the third vessel. If this is not done the proper chemical combinations will not take place, sediment will form that will produce clogging at the nozzle, and proper results will not be obtained by the spraying.

The proportions of the Ingredients.

The proportions above given provide ample lime to more than neutralise all the copper sulphate; in fact, there is more than twice the quantity required to convert the copper into the hydrate, provided, firstly, that the lime is pure; secondly, that it is freshly burnt; and thirdly, that the lime is really all made into wash.

With regard to the latter point, instructions are often disregarded, and in many cases not more than a quarter or half the quantity of lime recommended becomes finally combined with the copper.

If, in addition to this, the lime is not pure, and has been burnt some time before being used, it may quite easily happen that, instead of the above quantities of lime being in excess of what is required, they may be altogether insufficient for the purpose, and that the solution may contain free copper sulphate. Assuming that free copper sulphate, even in small quantities, does "burn" the foliage, and that it is undesirable to have any in the mixture on this account, it appears preferable to have no fixed quantity of lime, but simply to have a definite quantity of copper, and to add the lime until the copper is neutralised.

In order to know when the copper sulphate is neutralised, the readiest test is ferrocyanide of potassium; but it is important to remember that at a certain point ferrocyanide ceases to give the characteristic colouration (in such a solution as we are dealing with), although there is still unaltered copper sulphate in solution. In other words, the solution may contain sulphate of copper in such a condition as to burn the foliage, although the ferrocyanide test, applied as directed, does not show it. Therefore it is important to remember that the mixture is not ready for use when ferrocyanide no longer gives a red colour, but that a quantity more lime (even half as much again) must be added.

Instead of ferrocyanide, a rough test to show when sufficient lime has been added consists in placing a clean knife-blade in the mixture for a few minutes. If there is no red stain on the knife-blade, the copper solution is neutralised. When this point is reached, add more lime.

Vessels employed.

For the copper solution, wooden vessels are preferable, though copper vessels may be used. Iron vessels should be avoided. For the lime, use wooden tubs or barrels. Do not leave the mixture in the spray-pump, as it will slowly attack the copper; but when the spray is finished, pour it away and wash the pump and hose well with water.

Purity of Ingredients.

Samples of "bluestone" are often received which contain a quantity of sulphate of iron. The following hints will enable anyone to detect such a compound. Bluestone should be in the form of dark blue crystals (the adulterated mixture referred to is light blue, like sulphate of iron). They dissolve completely in water—readily and completely in hot water or water to which any acid is added.

In order to test its purity still further, add ammonia. A pale-blue precipitate is formed, which dissolves to an intense blue colour. This solution should be perfectly clear, and leave no sediment on standing. If a reddish sediment settles, it is due to the presence of iron.

Lime.

The best freshly-burnt stone lime only should be used. To test it, place a few lumps in a small heap and sprinkle with water. The water should be absorbed by the lime, when the latter gradually falls to pieces, becoming very hot in the process, and giving off a quantity of steam. It gradually crumbles to a fine, white powder. If it does not get hot enough to give off steam, it has not been freshly burnt.

Peach Freckle.

Nearly every orchardist knows this fungus pest, which is so common upon all the late varieties. It forms a number of black smutty circular spots upon the skin of the ripening fruit, generally thickest around the stalk. Many orchardists will tell you that this is caused by the aphis; but there is little doubt that it is a distinct fungoid growth, having nothing to do with the aphis.

Spraying with Lime-sulphur mixture after the fruit is set would probably check it, but very little seems to be known about this pest.

Peach Mildew—(Podosphæra oxycanthæ, De Bary).

The young foliage is attacked early in the season with this mildew, which wrinkles the surface of the leaves, and covers them with patches of white powdery substance, which frequently thickens their tissue.

When the peaches are about half-grown they are sometimes attacked, and when this is the case it produces white patches of a similar nature, which increase up to half an inch in diameter, and become discoloured and hard, causing the fruit to crack.

Treatment.—Spray with dilute Lime-sulphur mixture as soon as the fruit has set.

Peach Rust—(Puccinia pruni, Pers.).

This is a very common disease upon the foliage of peach, nectarine, and almond trees. The leaves become more or less freckled with light yellow spots, which grow into small pustules, that give rise to a mass of spores, forming a brownish dust when mature. The leaves turn yellow, and fall off much sooner than they would under natural conditions.

Treatment.—Spray with weak Lime-sulphur mixture soon after buds have burst; a second treatment to follow three or four weeks later. Eventually make a third spraying.

Peach Curl, Frenching—(Exoascus deformans, Fuckl.).

The fungoid disease causes the young foliage to become crumpled and puffed out in bladder-like swellings, irregular in form, and extending across the leaf. The leaf is often thickened, and variegated in colour from pale yellow to reddish-brown instead of the natural healthy green colour of the other foliage. The diseased foliage generally falls off, and is replaced with fresh leaves before the season is over.

This fungus evidently lives upon the buds and twigs through the winter, for if buds are taken from a diseased tree and budded into a healthy stock, it will frequently produce curled leaves. It is a very difficult disease to deal with, and is very common in peach orchards in New South Wales.

Treatment.—All curled leaves should be picked off and burnt. Cultivation is said to decrease the attacks.

Spray with Lime-sulphur mixture at the time the blossoms are swollen, and again when fruits are half-grown if found necessary. Summer strength spray should be used. A spraying in the winter-time with lime and sulphur is also one of the best preventives.

In bad cases trees may be cut back to promote a more vigorous growth of healthy wood.

Orchard Notes.

W. J. ALLEN.

APRIL.

Harvesting.—The work of picking, packing, and marketing apples will continue this month ; also the storing of any late apples or pears in either cool stores or cool store-rooms in the orchards.

Green Manuring.—If this crop is not already in, it should be put in now with as little delay as possible, wherever such crop is to be grown among trees and vines. The soil in most of our fruitgrowing districts has had a fair soaking, and consequently the seed will germinate quickly after sowing.

Planting.—Planting of citrus trees may be continued this month. Where autumn planting is practised care should be taken in handling such trees not to expose the roots to either wind or sun. Those who intend planting out new orchards should get the land cleared and subsoiled as soon as possible, and trees secured. In buying apple-trees, see that they are all worked on blight-proof stocks, as trees worked on such stocks will not be affected by woolly aphis on the roots.

Refills.—The ground should be well worked up where such trees are to be planted in established orchards, and if the soil is poor or hard it would be as well to remove a load or two of the poor soil, and fill up the hole with good soil if there is any handy. Before filling up with this good soil it would be as well to sprinkle a few pounds of lime in the bottom of the hole. This will assist in sweetening the ground.

Scales on Citrus Fruits.—If there are any citrus trees on which the fruit is dirty, it would be well to fumigate immediately, if the trees are in good condition, as, if this work is done now, most of the scale will have fallen off the fruit by the time it is ready to be sent to market. Other States do not want spotted fruit, even though the scale may be dead. It is only those who have clean fruit who will be allowed to market it in New Zealand and the different States of the Commonwealth. Fumigating tables and information on fumigating may be had on application to the Department of Agriculture.

Codlin Moth.—Where bandages are used they must still be kept on the trees, as, even after all the fruit is removed, an occasional grub finds its way to the bandages. All props should be removed from the orchard, and any grubs adhering to them destroyed.

A solution which finds great favour now is arsenate of lead, of approved brands, which do not burn the foliage as will the other sprays, and require no boiling or lime, but have only to be diluted in cold water. Two pounds of arsenate of lead to 50 gallons of water will be found quite strong enough for the first application, while 1½ pounds is sufficient for subsequent applications. The apple-trees should be given a thorough spraying just as soon as most of the petals have fallen; then give two later sprayings, at intervals of about thirty days. At each spraying be careful to cover every part of the tree and fruit. Those who have systematically sprayed this year report that they have had very little moth-infested fruit, and that spraying when properly carried out is in every way superior to bandaging.

Specimens of Fruit.

I have to acknowledge receipt of very fine specimens of apples, pears, and quinces from growers in different parts of the State. Most of the specimens were submitted without any description of the habit or growth of the trees, or any particulars whatever. I would therefore suggest, for the guidance of those who wish to submit such specimens in future, that they give a full description of the tree, when the fruit ripens, the name (if any) by which the fruit is known in the district, and any other information which may help myself or the orchardists in naming such fruit. Typical specimens should, of course, always be sent with a stem of average length.

Mr. H. A. James has forwarded me some splendid samples of the President Plum from Hazelbrook. The tree is a strong grower, prolific bearer, plums large, luscious and juicy and the variety appears eminently suited for extensive planting in the mountain districts.

BEES AND SPRAYING FRUIT-TREES.

IN the Victorian *Journal of Agriculture*, Messrs. E. E. Pescott, Principal of the Horticultural School, Burnley, and F. R. Beuhne, Bee Expert, report an experiment to ascertain whether there is any danger to bees by spraying fruit-trees with poisonous mixtures whilst in bloom. The following extract summarises the results:—

> At the Burnley Apiary, the bee-hives are right under the fruit-trees, and at the time of spraying with Bordeaux mixture the ground had not yet been ploughed, so that the spray fell not only on any fruit blossoms which were open, but also on the Cape weed then abundantly in bloom.
>
> Neither the spraying with Bordeaux mixture nor the subsequent one with arsenate of lead had any effect whatever upon the bees, the colonies developing normally, and without any check; there was not at any time dead brood in the hives. There is no doubt that under the atmospheric conditions prevailing at the time the spraying of the trees proved quite harmless to bees. Observations will, however, be continued in future, to demonstrate whether spraying is injurious to bees at all; or, if so, under what conditions.

Agricultural Bureau of New South Wales.

(NOTES COMPILED BY E. HARRIS.

Branch.	Honorary Secretary.
Bathurst	Mr. J. McIntyre, Orton Park.
Bonville	Mr. H. B. Faviell, Bonville.
Cardiff	Mr. D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coreen-Burraja	Mr. H. Vickers, Coreen.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. T. Glasgow, Kellyville.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Lawrence	Mr. E. T. Cooney, Lawrence.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, Penrose.
St. Mary's	Mr. W. Morris, Queen and Victoria sts., St. Mary's
Sackville	Mr. C. H. Britten, Sackville.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. T. Collins, jun., Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. S. Mann, Good Hope, Yass.

OBJECTS.

The objects of the Bureau are to hold regular monthly meetings at which members may read papers on various points of local or general interest in connection with agriculture, discuss the same, and exchange experiences; to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

Wherever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

The Government will subsidise the Branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a précis of any paper which may have been read and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

The Department is willing to supply to any branch requiring same, a set of insects, being the common pests of the district, if a glass-topped case, 10 in. x 14 in., which would cost about 7s., be provided. Arrangements could be made for the case to be obtained in Sydney.

Bathurst.

On 14th March Mr. M. A. O'Callaghan, Dairy Expert, gave a lecture to the members in the Technical College Hall, on "The most suitable Dairy Cattle for the District."

Bonville.

At the meeting held at the Bonville Hall, on the 7th February, Mr. Singleton read an instructive paper on "Pigs for the Farmer."

Cardiff.

Messrs. W. Wolley, A. Straker, S. Walton, A. Crompton, and W. Barret have joined this branch.

At the last meeting, Mr. Stanley Hopkins read a paper on "Peach-growing—Does it Pay?" His experience was based upon nine sorts, 12 of each, totalling 108 trees to the acre. The return from the dozen trees of "Edward the Seventh" variety he put down at 16s. per tree, or £9 12s. for the dozen; from one dozen each of "Triumph" and "Greensborough," £12 each; "Carmen" and "Wiggins" at £14 8s. each; "La France" at £12; "Early Crawford" at £10 16s; "Mountain Rose" and "Elberta," £10 10s.; or a total income of £106 4s. from the one acre of 108 trees, less £2 14s. for manure.

The meeting was not in agreement in regard to the prices fixed, and it was pointed out that no allowance was made for damage by storms or other causes.

Carlingford.

At a recent meeting of the branch, consideration was given to the question of "Co-operation." Members were agreed as to the necessity for co-operation, and fully recognised the benefits that would accrue therefrom, but were of opinion that owing to the lack of cohesion amongst producers, much educational and organising work was required to prepare the way for co-operation in this district. The meeting could not therefore see its way to submit any definite proposal at the present time, but could only undertake to utilise every opportunity for advancing the cause. It was considered that when the time arrived for making a start, the establishment of co-operative purchasing should precede co-operation in the marketing of products. In this way, the advantages of co-operation could the more readily be demonstrated and thus give an impetus to the establishment of both branches of the movement on a sound footing. In the opinion of the branch, co-operative purchasing and selling societies which may be established in any of the agricultural centres of the State, should be self-supporting and conducted on commercial lines. As, however, the undivided support of the members of such societies would be an essential factor in their success, the purchase of a share of a sufficiently high value to secure this end should be made an obligatory condition of membership. As an inducement to suitable persons possessed of the requisite organising ability and commercial knowledge, to undertake the formation of Societies, on business lines, and subsequently act as managers of same, the Government might consider it advisable to offer, say, the free use of so much Crown land, if available, in proximity to railway stations or wharves, as would be required for depôts, and might further offer special facilities in the way of cheap and expeditious transit of goods, carried per rail, to and from such depôts.

Coreen-Burraja.

Mr. Veterinary Surgeon Palgrave delivered a lecture in the School of Arts, Burraja, on 26th March, on "Foaling and Mortality among Foaling Mares."

Cundletown.

On the 22nd February Mr. Inspector G. Marks gave a lantern lecture on "Fodder and its Conservation."

Dunedoo.

On 13th March Mr. Veterinary Surgeon Palgrave delivered a lecture in Croft's Hall on "Horses: their Breeding and Diseases."

Forest Creek.

"Horses: their Breeding and Diseases," was the subject of a lecture delivered by Mr. Veterinary Surgeon Palgrave on 28th February.

Grenfell.

A new branch has been formed at this place, and the following officers are acting temporarily:—President, Mr. W. H. Simpson; Vice-President, Mr. P. Cusack; Treasurer, Mr. J. H. Richardson; and Secretary, Mr. G. Cousins.

Residents in the neighbourhood who are desirous of joining the Bureau should communicate with Mr. Cousins.

Inverell.

Messrs. G. B Lewin, E. J. McBean, T. C. Armstrong, and C. E. Armstrong have joined the branch.

At a recent meeting a discussion took place on "Co-operation," and it was agreed that the time had arrived for the farmers to "pull together" if they wished to reap the full benefits of their labour.

At each meeting the subject for discussion at the next meeting is announced, so that members may become conversant with their subject. The idea is worthy of imitation by other branches.

Katoomba.

Mr. G. Bradshaw, of the Department of Agriculture, was the lecturer at this branch on 20th March, when much useful information in regard to poultry farming was given.

Keepit.

The following have been elected as members:—Messrs. T. Garland, J. J. Abberfield, Thos. Abberfield, W. Abberfield, D. Hayne, C. E. Parsons, and S. T. Wheeler.

Mr. A. H. E. McDonald delivered a lecture on the 30th March on "Wheat-growing."

The branch will hold a picnic on Easter Monday, and the annual meeting will be held on the second Saturday in April.

Kellyville.

On 21st February, at the Kellyville Public School, Mr. G. Bradshaw lectured to the members on "The Present Importance and the Future Prospects of the Poultry Industry in New South Wales." The lecture is reported to have been an exceptionally interesting one, and the growth of the industry of late years was ably illustrated. At the end of the lecture numerous questions were asked and answered, and a general discussion on poultry ensued. There was an attendance of about 50, Mr. Firth, the President, being in the chair, and all the office bearers being present. It is intended to endeavour to arrange for Mr. Bradshaw to deliver another lecture upon "Incubators and their Management."

Little Plain.

Meetings of this branch are held on the Thursday evening on or before full moon.

The subject for discussion on the 29th February was "The Best Use to which we may put our Farm Land."

The Sheep and Wool Expert gave a practical demonstration in sheep and wool on the afternoon of 7th March. In the evening a lecture was delivered, with lantern slides, illustrating the different types of sheep, at which there was an attendance of 40.

Mr. Inspector McDonald will lecture on "Silage-making" on the 11th April.

Milbrulong.

Mr. J. W. Mathews, Sheep and Wool Expert of the Department, visited Milbrulong on the 29th February, and gave a practical demonstration with wool to the members of the bureau, followed in the evening by a lantern lecture, at which the different varieties of sheep were dealt with in respect to their merits for the production of wool and mutton respectively. A second demonstration and lecture will be delivered on the 25th April, when practical instruction will be given amongst the flocks of the members.

Peak Hill.

Arrangements are being made for the Inspector of Agriculture for the district, Mr. H. C. Wilson, to lecture on "Wheat" to the members in the first week in June.

Penrose.

On 20th February Mr. Veterinary Surgeon Palgrave delivered a lecture on "Equine Diseases." There were 25 members present, and a discussion followed the lecture.

Sackville.

"Poultry Farming" was the subject of a lecture delivered by Mr. G. Bradshaw, of the Department of Agriculture, to the members of this branch on 29th March.

Mr. G. Turnbull has been elected a member.

Spring Hill.

The Manager of the Bathurst Experiment Farm (Mr. R. W. Peacock) lectured to the members on 2nd March on "Wheats and their Manures" suited to the locality.

At the conclusion of the lecture a number of questions were asked and answered.

Tallawang.

On 12th March Mr. Veterinary Surgeon Palgrave lectured on "Equine Diseases."

Toronto.

Arrangements are being made for a lecture and demonstration on "Budding and Winter Spraying" for some date in June.

Wagga Wagga.

The annual meeting of this branch took place in the School of Arts at 2 30 p.m. on the 2nd March, the chairman, Mr. E. Crouch, presiding. The treasurer's statement showed a credit balance of about £2. The honorary secretary reported that eight meetings had been held during the year, which included veterinary lectures at the Wagga Experiment Farm, Report on Dry Farming Conference held at Adelaide, South Australia, Addresses on "Take-all in Wheat," "Noxious Weeds and Plants," and two veterinary lantern lectures in the Town Hall. The membership of the branch has more than doubled during the year, and now numbers 62. The branch acknowledged its special indebtedness to Mr. McKeown, the Manager of the Wagga Experiment Farm, whose assistance had been invaluable. The election of office-bearers for the ensuing year resulted in Messrs. E. Crouch and G. Lindon being re-elected as chairman and vice-chairman respectively. Mr. C. Crouch was appointed auditor. Mr. Kelsey had, unfortunately, to decline nomination as honorary secretary, but has kindly consented to act in that capacity until his successor shall have been appointed. The membership fee was fixed at 2s. 6d. per annum.

The date of the next meeting will be Saturday, 6th April, and the subject will be a further discussion on "Noxious Weeds and Plants" and "Summer and Autumn Varieties."

Wyan.

On 18th March Mr. Inspector Marks gave a lecture on "The Soil." A veterinary officer will visit this branch some time in June, and lecture to the members on "Diseases of Stock."

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

LAME COLT.—"Narromine": The hock trouble is probably due to bursal enlargements—what is known as "Bog Spavin." It is unlikely that any treatment will be of much avail. Working him early is likely to aggravate the condition.—VETERINARY OFFICERS.

FILLY WITH SORE LEG.—"T.T.": The information supplied is somewhat vague, but if you carry out the following treatment you will probably find it beneficial. If the swelling on the leg again bursts, the part should be cleansed twice daily with a warm 10 per cent. boracic solution, and the wound washed out with a solution of perchloride of mercury of the strength of one part of mercury to 1,000 parts of water.

To endeavour to improve the animal's internal condition, the following powder might be given in a damp feed night and morning for twelve days:—Epsom salts, 2 oz.; sulphur, 1 oz.; nitrate of potash, 2 drams. This constitutes one dose. As much green feed as possible should also be provided.—VETERINARY OFFICERS.

INBRED BULL.—"C.P." has a pure-bred Jersey bull calf, produced by the accidental mating of a pure-bred cow with her own son. He asks whether the calf would be suitable to keep for a bull.

Provided the young bull shows plenty of vigour, he may be used, especially if required for cross-breeding.—M. A. O'CALLAGHAN.

GREEN MANURING OF ORCHARDS.—"F.H." (St. Ives): The principal manurial ingredient provided by a green crop such as *Trifolium subterraneum* is nitrogen. Mineral manurial substances, potash and phosphates, are also supplied, but in very small proportions. Consequently it cannot be regarded as a complete manure, and should be supplemented with sulphate of potash and superphosphate.—F. B. GUTHRIE.

AFFECTED FEET OF CATTLE.—"H.F.": Each animal should receive a good dose of laxative medicine, such as 1 lb. Epsom salts. The foot should be well bathed with hot water, to which a little lysol has been added, so as to thoroughly cleanse the affected parts; and if it is found that pus is undermining the wall of the hoof, the horn should be at once removed with a knife to allow free drainage for it. Hot poultices of bran and linseed should then be applied to the foot, and continued for two days, and a little lysol should be added to the water used to mix them. After this a little cotton wool, soaked in a 5 per cent. solution of chloride of zinc, should be applied to the affected parts twice daily, and bandaged, to be continued until the parts are quite free of discharge. The use of the chloride of zinc should then be discontinued, and a little of the following powder applied once daily, and continued until the parts are quite healed:—Iodoform, 1 part; boracic acid, 6 parts. The mixture when applied should be covered with cotton wool and bandaged. Great cleanliness should be exercised throughout the treatment.—VETERINARY OFFICERS.

PRUNING AND FRUIT PESTS.—"W.E.W." (Dorrigo): You should apply to the Government Printer, Sydney, for the book on Pruning, cost 1s. 1d. post paid; also, for a book on Insect and Fungus Diseases of Fruit Trees, cost 1s. 2d. post paid.

With regard to the disease in Tomatoes, please forward specimens of infested plants, when an endeavour will be made to give advice as to treatment.—W. J. ALLEN.

WINE-MAKING ON A SMALL SCALE.—"G.D." has read the note on this subject in April, 1911, *Gazette*, page 320, but asks for further information.

A cask cut in two, and made into wooden tubs, would do as a vat. "Vat" here means a cylindrical vessel, slightly conical, without cover. Stalks, skins, and seeds come to the top and act as a cover, though, in some cases, a temporary cover is made with wooden planks. The juice starts to ferment by itself, and for a certain time the fermentation is very active, and there is a great deal of carbonic acid gas produced. This lasts for five or six days, more or less. The cooler the outside temperature the longer the fermentation lasts. After the first period of fermentation, when the production of gas has apparently ceased, the wine is racked. It still evolves carbonic acid gas slowly, and that is why a bung cannot be driven on the first cask, as the gas would either burst the cask or drive out the bung, causing loss of wine. After one or two months, according to temperature, &c., the fermentation is practically complete, all the sugar being transformed into alcohol. There is no more evolution of gas, and the wine must then be well protected from contact with the air. The object of the ullage is to prevent this contact. It follows that the jars and bottles filled for the purpose of ullage must be loosely corked.

Enamel buckets or wooden (clean) vessels can be used for shifting the wine from one cask to another, provided the wine is not left there longer than necessary.

An empty cask can be kept sweet by burning sulphur in it until the fumes come out of the opening, and keeping it well corked; also, by putting in it 2 oz. potassium metabisulphite with 4 oz. water, and keeping it closed. These quantities are for a 15-20 gallon cask.

The addition of sugar to the must or wine is not permitted if the wine is for sale. Those who add sugar to a wine or must when it contains more than 18 per cent. sugar, are liable to prosecution under the Wine Adulteration Act.

"Dry wine" is one completely fermented, *i.e.*, all the sugar contained in the original grape juice has been transformed into alcohol. You could add sugar to a dry wine, but you could not sell it. Sugar added to dry wine would endanger its keeping qualities; most likely it would ferment again, the wine would become cloudy, form a sediment, and after some time even become dry again, unless a considerable quantity of sugar were added.

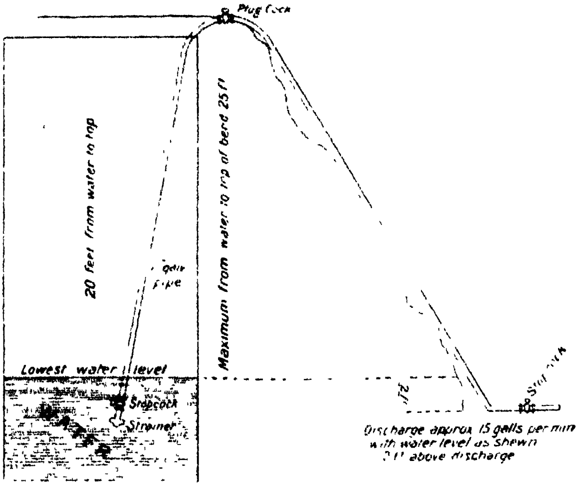
You will find it less difficult to make wine if you rack it as prescribed, and take care that it is not left for any length of time in contact with air.—L. A. MUSSO.

SYPHON FOR DRAWING WATER.—"W. S. R." (Bangalow): The Public Works Department states that, assuming the water in the well is of constant depth, and at 20 feet from the level of the top of the well, the syphon will lift the water without difficulty to the top of the well, and discharge at any level below that of the surface of the water in the well, with a velocity due to the difference between the surface level of the water and discharge. The attached sketch is prepared on this assumption.

If the total depth of the well is 20 feet, and it is constantly full of water, the syphon will discharge at any point below the surface of the water.

If the well is 20 feet deep and varies in water-level, then the discharge must be below the lowest point to which the water descends, and the top of the bend must not be more than, say, 25 feet above the surface (34 feet theoretically.)

To set the syphon to work, first close the cocks at each end of the syphon; then remove the plug in the top of the bend, fill the pipe with water, replace the plug, and open the valves at the ends of the syphon.


Plug Cock
20 feet from water to top
Maximum from water to top of bend 25 ft
pipe
Lowest water level
Stopcock
Strainer
2 ft
Stopcock
Discharge approx 15 galls per min with water level as shewn 2 ft above discharge

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (imp).	Wollongbar Farm	*
" ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
" ...	Royal Pansy ...	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
" ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	" "	*
" ...	Jamaica Jack ...	Sir Jack ..	Rum Omelette (imp.).	Wollongbar Farm	*
" ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ..	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Casino	26 May, '12.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Lismore	31 July, '12
" ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Palmer's Island ...	15 July, '12.
" ...	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Casino	16 July, '12.
" ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	H.A. College, Richmond	†
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Glen Innes Farm...	†
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
" ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	Tweed River ..	12 Aug., '12.
" ...	Prince of Warren Wood (imp.).	Kingsmoor Governor.	Quail... ...	Macleay River ...	20 Dec., '12.
" ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ..	Berry Farm ...	*
" ...	Calm Prince ...	Rose Prince (imp.).	Gentle (imp.).	" "	*
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	" "	†
" ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	Singleton	23 April, '12.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Casino	13 June, '12.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 Nov., '12.
Ayrshire ...	Jamie's Ayr ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm.	*
" ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
" ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	" "	*
"	Bratha's Boy ...	Aiome Chin (imp.)	Bratha 4th ...	" "	*
"	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

Department of Agriculture,
Sydney, 2nd April, 1912.

BULLS FOR SALE

AT ROYAL AGRICULTURAL SHOW, 1912.

THE following bulls will be offered for sale at the Royal Agricultural Show, Sydney, at the prices named :—

SHORTHORN.—Roan Pansy: sire, Royal Hampton X (imp.); dam, Forest Pansy; calved 3rd December, 1910; colour, roan. Price, **25 guineas.**

Forest Pansy is by Oxford's Forest King (imp.) from Australian Pansy. Australian Pansy is by Airy Knight II from Pansy IV (imp.). This strain has proved a good dairying one for several generations of cows. Forest Pansy yielded 5,785 lb. milk in forty-one weeks, equal to 272 lb. butter.

JERSEYS.—King of the West: sire, Jamaica Jack; dam, Lady Tidy III (imp); calved 15th March, 1911; colour, whole fawn. Price, **60 guineas.**

Jamaica Jack is by Sir Jack from Rum Omelette (imp.). Sir Jack realised 170 guineas at auction at Royal Agricultural Show, 1910. Lady Tidy III in a milking period of thirty-eight weeks gave 5,678 lb. of milk, which averaged 5 per cent. of butter fat.

The Greek: sire, Berry Melbourne; dam, Maid of Athens; calved 29th April, 1911; colour, whole fawn. Price, **25 guineas.**

Maid of Athens is by Sir Jack from Calceolaria II. Calceolaria II is by Thessalian (imp.) from Calceolaria (imp.). Berry Melbourne is by Melbourne (imp). from Rum Omelette (imp.). Maid of Athens on her first calf yielded 3,477 lb of milk, testing 4·6 per cent. butter fat.

GUERNSEYS.—Shamrock Prince: sire, Calm Prince; dam, Shamrock of Les Vesquesses VI (imp.); calved 18th December, 1910; colour, lemon and white. Price, **45 guineas.**

Calm Prince is by Rose Prince (imp.) from Gentle (imp.). Shamrock of Les Vesquesses VI yielded 4,941 lb. of milk, testing 4·9 per cent., last lactation period.

Lord Donnington (imp.): sire, Lord Horne of Warren Wood (1962, E.G.H.B.); dam, Donnington Hasel (imp.) (7231, E.G.H.B); calved 19th August, 1911; colour, lemon and white. Price, **40 guineas.**

Donnington Hasel in fourteen weeks after calving yielded 2,585 lb. of milk, testing 5·1 per cent., or equal to 11 lb. butter per week for that period.

Alexander the Great: sire, Claudius; dam, Alexandrina of Richmond; gd, Alexandrina IX (6399, E.G.H.B.); 3d, Alexandrina II (3220, E.G.H.B.); 4d, Alexandrina (3219, E.G.H.B.); calved 6th November, 1910. Price, **£40.**

AT BERRY STATE STUD FARM.

SHORTHORNS.—Hamlet: sire, Royal Hampton X (imp.); dam, Panacea; calved 30th November, 1910; colour, red. Price, **£15.**

Panacea is by Dora's Boy from Pansy Girl. Pansy Girl is by Favourite (imp.) from Australian Pansy. Australian Pansy is by Airy Knight II from Pansy IV (imp.).

The Pansy strain has proved a good dairying one through several generations of cows.

Henry Irving: sire, Royal Hampton X (imp.); dam, Fauvette; calved 25th December, 1910; colour, red and white. Price, **£30.**

Fauvette is by Favourite (imp.) from Oxford's Fanny. Oxford's Fanny is by Oxford's Forest King from Fanny 78th (imp.).

Fauvette yielded 7,132 lb. of milk last season.

AYRSHIRE.—Sir Julian: sire, Auchenbrain Spicy Jock (imp.); dam, Lady Julian; calved 5th December, 1910; colour, brown and white. Price, **£15.**

H. C. L. ANDERSON, Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1912.

Society.	Secretary.	Date.
Royal Agricultural Society (Sydney)	H. M. Somer ...	April 2-10
Adaminaby P. and A. Association	W. Delany ...	,, 10, 11
Bathurst A., H., and P. Association	J. Bain	,, 17, 18, 19
Hunter River A. and H. Association	E. H. Fountain ...	,, 17-20
Moree P. and A. Society...	D. E. Kirkby ...	,, 23, 24, 25
Richmond River A., H., and P. Society (Casino) ...	D. S. Gayner ...	,, 23, 24, 25
Orange A. and P. Association (Jubilee Show) ...	W. Tanner ...	,, 24, 25, 26
Dungog A. and H. Association	C. E. Grant ...	May 1, 2.
Dubbo P., A., and H. Association	F. Weston ...	,, 1, 2
Kyogle P., A., and H. Society	M. P. Dunlop ...	,, 1, 2
Clarence P. and A. Society (Grafton)	G. N. Small ...	,, 7, 8, 9
Coonamble P. and A. Association	J. M. Rees ...	,, 8, 9
Walgett P. and A. Association...	W. Neal	,, 15, 16
Nyngan and District P. and A. Association	R. H. A. Lyne ...	,, 28, 29
Hay P. and A. Association	G. S. Camden ...	July 9, 10
Deniliquin P. and A. Society	L. Harrison ...	,, 18, 19
Peak Hill P., A., and H. Association...	A. Yeo . ..	,, 24, 25
Condobolin P., A., and H. Association	A. Turner... ..	,, 30, 31
Riverina P. and A. Society (Jerilderie)	J. Kennedy . .	,, 30, 31
Narrandera P. and A. Association ...	W. T. Lynch ...	Aug. 6, 7
National A. and I. Ass. of Queensland (Brisbane) . .	C. A. Arvier ...	,, 12-17
Coolamon A. and P. Association	E. Owen . .	,, 13, 14
Forbes P., A., and H. Association	J. H. Bates ...	,, 13, 14
Murrumbidgee P. and A. Association (Wagga) ..	A. F. D. White ...	,, 20, 21, 22
Parkes P., A., and H. Association	G. W. Seaborn ..	,, 21, 22
Corowa P., A., and H. Society	J. D. Fraser ...	,, 27, 28
Gunnedah P., A., and H. Association...	M. C. Tweedie ...	,, 27 29
Northern A. Association (Singleton)	F. A. Bennett ...	,, 28, 29, 30
Ariah Park P., A., H., and I. Association ..	J. N. Taylor ...	Sept. 3, 4
Germanton P., A., and H. Society	J. S. Stewart ...	,, 4, 5
Albury and Border P., A., and H. Society	W. I. Johnson ..	,, 10, 11, 12
Young P. and A. Association	G. S. Whiteman...	,, 10, 11, 12
Cootamundra A., P., H., and I. Association	T. Williams ...	,, 17, 18
Cowra P., A., and H. Association	W. T. Fisher ..	,, 17, 18
Wellington A., P., and H. Association	A. E. Rotton ...	,, 18, 19
Canowindra P., A., and H. Association	G. Newman ...	,, 24, 25

1913.

Society.	Secretary.	Date.
Central Cumberland A. and H. Association	H. A. Best ..	Feb. 21, 22

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VOL. XXIII. PART 5. MAY 2, 1912.

Agricultural Gazette of New South Wales.

Superphosphate for Wheat.

THE results obtained during the last three years from the manurial trials in connection with the Farmers' Experiment Plots, indicate a valuable principle for the guidance of farmers in manuring wheat lands. If those results are maintained in succeeding years, it will be clear that the beneficial effect of superphosphate decreases as we go north. On the south-western slopes and in Riverina, the benefit derived from the application of about ½ cwt of superphosphate per acre is most marked. In the western districts, the central portion of the wheat-belt, there is still a considerable advantage, but it is by no means as great as in the south. In the north-western districts, the northern portion of the belt, the average yields indicate that the benefit to be derived from superphosphate is not sufficient to cover the cost of purchasing and applying the manure.

The following table gives the average results obtained in each of the three years. It will be seen that there has been some variation in the manures tried, but the table gives sufficient data to justify the tentative conclusion mentioned. Moreover, although the western district results cannot be subdivided clearly, owing to the plots not having always been located in the same position, there is sufficient data to justify the inference that in the central portion of the State, the benefit from superphosphate decreases from south to north.

The result may be affected more or less by the fact that fallowing is more common in the south than in the west, and much more than in the north. The proportion of fallowed land in the experiment plots was roughly in accordance with the practice of the district.

But it is not at present proposed to offer any suggestions as to the cause of this phenomenon. It is sufficient for the present that farmers should note the indications. In the south superphosphate should always be used, unless the farmer has clear evidence that it will not benefit his crop; and such cases will be found to be very rare. In the north, superphosphate should only be used for experiment purposes, if at all, as a farmer who applies it to a large portion of his land will be very unlikely to get a sufficient return for his outlay. In the western districts, each farmer must use his own judgment, the general principle being that the nearer he is to Riverina the more certainty there is that the manure will benefit his crop to a payable extent.

Farmers' Wheat Experiment Plots.

Average Yields in Manurial Trials, 1909–1911.

Manure	1909.						1910.						1911.					
	North.		West		South		North		West.		South		North.		West.		South.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
No manure	20	15	19	32	20	2	9	52	13	45	24	6	23	30	14	5	15	31
56 lb. superphosphate per acre .	21	11	20	22	24	16	10	52	16	16	30	29	23	23*	17	22	22	6
42 lb. superphosphate and 14 lb. sulphate of potash per acre . . .	21	4	21	56	25	17	11	43	16	6	29	40	†		17	0	‡	

* 42½lb. superphosphate per acre. † As only 4 plots were tried, results are not comparable. ‡ No potash manure tried, but 84 lb. superphosphate gave average yields of 22 bushels 15 lb

Wheat Crops, Bathurst Experiment Farm, 1911.

R. W. PEACOCK, Manager.

UPON the Demonstration Area at this Farm, the wheat crops are dissociated from the Experiment Areas, and are grown as far as practicable upon commercial lines. The results, therefore, are of especial interest to farmers, as also are the many factors leading up to them. It is thought that a discussion of these may prove helpful as each individual season brings its problems, some of which may be controlled by foresight, the outcome of experience, whilst some are beyond the control of the farmer.

The system of farming followed on this area is a mixed one, sheep being grazed in conjunction with the growth of wheat.

Rotation.

This combination allows of a profitable crop rotation, in this instance a two course one. The Demonstration Area is practically divided into two portions, one being under wheat and the other under fodder crops for sheep the same year. The portion under wheat in one year is brought under fodder crop in the next.

Short Fallows.

This system allows of short fallows, which have proved very successful. The fodder crop is planted from the middle of February to early March, and consists of rape and barley sown in alternate drills. In some instances oats or rye is substituted for the barley in the mixture. These crops are fed-off for five months, approximately from the middle of May to the middle of October. The stock are then removed, and before the barley, rape, or weeds can produce seeds, the land is ploughed and left fallow until the following March and April, when it is sown to wheat. This allows of a fallow of about five months, throughout which, if rains induce weeds, these are destroyed by skim-ploughing with multiple ploughs. This skim-ploughing is more effective in destroying weeds than several ordinary cultivations.

As a result of this fallowing, considerable moisture is conserved and held over till sowing time to supplement the rainfall throughout the wheat's growing season. The importance of this reserve of moisture in the soil was again demonstrated in the season under review. Dry conditions frequently occur during the period of growth of the wheat, and these occurred during last winter. Where moisture was conserved the crops continued their vigorous growth unchecked, whereas upon unfallowed areas the crops suffered.

Soil Moisture.

From determinations of the soil moisture contained in the fallows at seeding time, it was found that an equivalent of approximately 11·36 inches of rainfall was conserved over the limit of moisture the soil contains which is not available to promote growth. This limit in this soil appears to be approximately 7 per cent. The soil of an adjoining paddock which grew wheat the previous year and had not been fallowed only contained an equivalent of 2·19 inches above the limit of 7 per cent.

From the experience of the past eleven years at this Farm, it is estimated that a 30 to 40 bushel wheat crop requires approximately 15 inches of rainfall with fair average distribution. Without conserved moisture this quantity must fall throughout the wheat's growing season, but when moisture is stored in the soil a smaller quantity will ensure maximum returns. The rainfall throughout the growing season, April to November inclusive, for 1911 was 12·55 inches. Of this quantity 3·74 inches fell in November, and the crops could not avail themselves of all of it. This rainfall, together with the moisture conserved in the soil, produced crops from 30 to 40 bushels per acre.

Loss by Storms.

The tabulated yields do not show such good results, but these were reduced by storms when the crops were ready to harvest. Excessive rains, accompanied by gales of wind, blew the heavy crops down, and before they could be harvested strong drying winds were responsible for still further losses. It is estimated that the yields were reduced by 5 to 6 bushels per acre. This estimate is based upon the returns obtained from other portions of the Farm from the same varieties which were harvested before the disastrous winds were experienced, and which averaged 34 and 35 bushels per acre; yet these crops were not considered as good as the best on the Demonstration Area, which only averaged 26 bushels per acre after the full effects of the storms. Unfortunately the heaviest crops suffered most.

The result was that the average yield was actually reduced to 23⅓ bushels per acre. Estimated losses must ever be unsatisfactory. Yet when discussing the factors which lead to the production of crops, it is only fair to state that the actual average grown would have been 28 or 29 bushels per acre, with yields from some paddocks up to 35 bushels per acre.

The following statement gives the returns, together with the treatment of each paddock.

Rainfall.

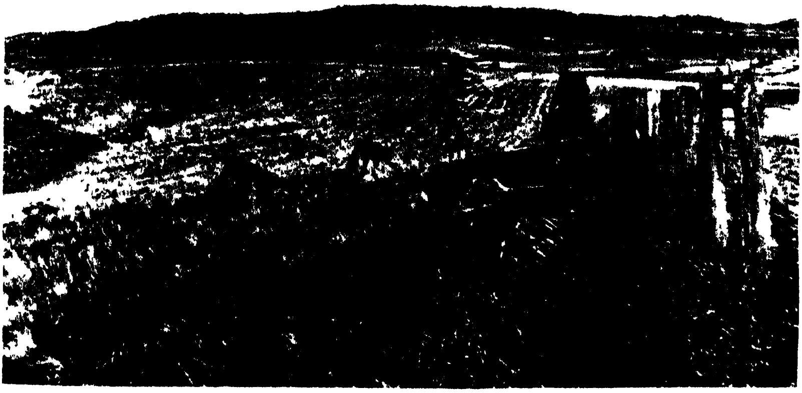
The quantity of rain and its distribution are amongst the most important factors in the growth of crops, and they are therefore given :—

January ...	381	points.	July ...	163	points.
February...	271	„	August ...	70	„
March ...	150	„	September ...	183	„
April ...	34	„	October ...	155	„
May ...	164	„	November ...	374	„
June ...	112	„	December ...	390	„

Total, 24·47 inches.

This total is the highest since 1901. Owing to the faulty distribution, the season proved unsatisfactory. During the first two months 652 points fell, and during the last two months of the year the rainfall was 764 points, leaving only 1,031 points for the intervening eight months. The bulk of the heavy rains in November and December were decidedly harmful, and resulted in one of the most unsatisfactory harvests experienced here for over twenty years.

Paddocks Nos. 5 and 6. No. 5 in foreground.



Paddock No. 11. Crops being harvested after storms.

WHEAT CROPS, BATHURST EXPERIMENT FARM, 1911.

DEMONSTRATION AREA, BATHURST EXPERIMENT FARM, 1911.

Statement of Treatment, Yield, &c., of Crops.

Paddock No.	Area.	Variety.	Previous Crop.	Treatment.	Seed per acre.	Date Sown.	Manure per acre.	Date Harvested.	Yield per acre.	Remarks.
	Acres.				lb.				T. c. q. lb.	
5	10·39	Part John Brown, part Bobs.	Wheat.	Ploughed 4 in. on 19-1-11 Ploughed 4 in. on 16-4-11	30	20-5-11	30 lb. Superphosphate	4-11-11	1 3 2 10	These two varieties were very similar in season and yield.
									Bus. lb.	
6	4·87	Bobs for grain.	Cape barley and rape.	Ploughed 6 in. on 6-10-10	30	24-4-11	Nil... ...	8-12-11	20 32	Yields very much reduced by storms.
	3·64	Cleveland for grain.		Ploughed 4 in. on 10-1-11	30	3-4-11	30 lb. ..	8-12-11	22 40	Yields much reduced by storms.
	16·38	Cleveland for hay.		Ploughed 4 in. on 21-3-11	30	3-4-11	30 lb. ..	10-11-11	....	....
11	29·45	Cleveland .. .	Cape barley and rape.	Ploughed 6 in. on 11-11-10 Ploughed 4 in. on 25-1-11 Ploughed 4 in. on 29-3-11	27	5-4-11	30 lb. on very light ground.	12-12-11	26 12	A very heavy crop, but yields were seriously reduced by storms.
12	5·17	Bayah	Cape barley and rape.	Ploughed 6 in. on 25-10-10 Ploughed 4 in. on 4-2-11	28	25-4-11	Nil . ..	9-12-11	19 32	These two varieties have many characteristics in common. Yields reduced by storms.
	20·22	Federation ...		Ploughed 4 in. on 5-4-11	28	26-4-11	Nil... ..	9-12-11	20 48	

NOTE.—Headlands in all wheat paddocks were cut for hay.

Notwithstanding the good early rains, April proved very dry, and difficulty was experienced in getting some of the crops above ground, owing to the surface soil being dried out. Some of the grain sown in April did not germinate until after the rains on the 11th May. This fact allowed of a striking illustration of the necessity of keeping the fallows free from weeds.

In Paddock No. 6, which was under fallow and skim-ploughed in January, one portion was ploughed previous to rain and the other portion after the rainfall. On that ploughed prior to the rain a growth of weeds was induced, whereas on that ploughed after the rain the weed growth was very limited. The result was that the heavier growth of weeds pumped sufficient moisture out of the surface soil to prevent the grain from germinating directly after sowing in April. It had to wait until the rains of May. Upon the cleaner portion, the wheat germinated directly after sowing. The yield of hay from the portion germinating in April was 2½ tons per acre, and from that germinating in May, 34 cwt., so that the comparatively larger growth of weeds reduced the yield by 16 cwt. per acre.

The advantages of crop rotations, allowing of a five months' fallow before sowing the main cereal crops, cannot be too strongly commended for this district, as such ensure the conservation of sufficient moisture to supplement the rain which falls throughout the growing season, and thus ensure maximum returns. Weeds and diseases are also controlled, and the operations fit into the farm economy from the view-point of labour and plant.

The advantages of a shorter fallow, from the standpoint of moisture, were demonstrated during the season. Land was ploughed as early as possible in January, after the preceding crop had been harvested. This destroyed the weeds and conserved the January and February rains, which aggregated 6 inches and 52 points. The satisfactory return of 26 bushels of wheat per acre was taken. It may be added that if this land had not been ploughed in January the rains, instead of being conserved for the next crop, would have been used up in weed growth and otherwise lost. The practice of continuous cropping and ploughing only prior to seeding has been found wanting, and comparisons with the above methods are not available. Upon adjoining soil, up to 40 bushels per acre were harvested, when crops were rotated and land fallowed for five months.

Varieties.

Cleveland has again upheld its reputation as a very suitable dual-purpose wheat for this district. It yielded as high as 40 bushels of grain, and 3⅓ tons of hay, per acre. Considering its length of straw it withstood the storms as well as could be expected. To get the best results it should be sown early, certainly during April.

Federation was also satisfactory as regards yield, and its short straw allowed it to weather the storms better than many other varieties. It should be sown about mid-season, during the latter half of April or early in May.

Bayah has many of the characteristics of Federation, and should be treated similarly.

Bobs is a suitable variety for the late sowing, during May, for both hay and grain. It does not yield as heavily as the others.

John Brown was also sown for hay, and, like Bobs, is very suitable for this purpose.

Points for Consideration.

The following points are worthy of serious consideration:—

Fallow to conserve moisture. A five months' summer fallow has proved satisfactory for this district.

Keep the fallows free from weeds. Plough as soon as possible after the preceding crop is off, to destroy weeds and conserve moisture.

A two months' fallow is better than none at all. A five months' fallow is best, and is recommended.

Rotate your crops.

Sow as early as is consistent with the habits of the varieties chosen.

FEEDING WHEAT TO HORSES.

A CORRESPONDENT recently forwarded to the Department of Agriculture a sample of mixed sorghum chaff (Amber Cane, Planter's Friend, and other kinds) which he had been feeding to horses drawing wheat. Some dry wheat was also mixed with the chaff. The horses were affected with flatulence, and only the services of a veterinary surgeon saved their lives.

In the Chemical Laboratory the sample was examined for hydrocyanic (prussic) acid, but none could be found. It was a very poor sample of chaff, being very coarse, woody, and dry, and not at all suitable for working horses. The correspondent did not state how much dry wheat was fed, but it is important to remember that feeding dry wheat to horses is risky, and has a tendency to produce flatulence. The wheat should be cooked before feeding.

IRRIGATION OF WHEAT FOR HAY WITH ARTESIAN WATER.

WITH regard to the recently published list of varieties of wheat recommended by the Department of Agriculture, a correspondent in the Coonamble district asks whether the recommendation of the varieties Zealand, Florence, Marshall's No. 3, and John Brown, for growing for hay under irrigation, applies when the irrigation is by artesian bore water. He says that the hay on the irrigated land turns out most unpalatable.

Mr. George Valder, Superintendent and Chief Inspector of Agriculture, replies:—

> Yes, we recommend these wheats for irrigation by bore water. The fault, however, is usually not so much with the variety, as with the way the crop is grown. For instance, our experience at Yanco is, that if the land is well watered before sowing, as a rule no further watering is required; and, usually, if the crop is watered during the growing period, the hay is of inferior quality. That means that the real cause of the inferior quality is the application of too much water. Unless the season is a very dry one, it is a mistake to water during the growth of the crop.

Cereal Crops at Wagga Experiment Farm, 1911.

G. M. McKEOWN, Manager.

PADDOCK No. 3A, which had borne a crop of grain, was ploughed in the spring of 1910, cultivated with discs in the interim, and again lightly disc-ploughed in 1911. The last-named operation was rendered necessary by the heavy rains which fell during the first ten weeks of the year, the average record being a little less than an inch per week. The ploughs were followed by harrows and rollers. This heavy precipitation beat down the cultivated land, and succeeding high temperatures caused the upper stratum to crust, and then when worked to break into nodules, instead of the fine particles desirable in a seed-bed under our conditions. No rain fell between the 20th March and the 9th May.

Wheat of the Zealand variety was sown from 5th to 13th April for grain production, ½ cwt. No. 1 superphosphate being drilled with the seed. The crop was rolled in August when advanced in growth.

Under farmers' conditions, the most profitable use to which this crop could have been put would have been to cut it for hay, as it produced a heavy crop of straw, the grain yield being light, as is usual under such conditions. A rather later sowing would have produced a lighter straw yield, but the grain crop would have been heavier.

The hay yield would have been upwards of 3 tons per acre, but as we have to supply seed grain we had to harvest the crop for the latter purpose. The grain yield for 90 acres was 16 bushels 19 lb. per acre.

A substantial return will be received from the sale of straw, for which we are receiving equal to 40s. per ton on the farm; the total receipts, however, being considerably less than would have been realised from hay under existing conditions.

PADDOCK No. 5A was ploughed in September, 1910, and allowed to lie till sowing time without other cultivation than harrowing in early summer and in the late autumn. It was lightly disc-ploughed in May. The land being the lowest on the Farm, was inaccessible in the early part of the year owing to the excessive unseasonable rain.

Thirty-two acres were sown with Zealand for grain on 5th to 7th June, but the paddock proved too wet for further operations until 27th June, when Bunyip and Comeback were sown in the remainder of the land. Half a cwt. of No. 1 superphosphate was sown with the seed. The following were the yields:—

Zealand ...	... 13	bushels	34	lb.	per acre.
Bunyip ...	... 12	,,	22	,,	,,
Comeback	... 21	,,	58	,,	,,

Paddock No. 4A consists of 110 acres of new land. Owing to the decision to add to the experimental area by the transfer for such purposes of a large area of land hitherto used for crops, it became necessary, in order to make up the deficiency as far as possible, to commence clearing immediately threshing was completed. There was no time, therefore, to sweeten the land by fallowing, as the drills had to follow the ploughs and harrows in order to sow within the season. The whole of the paddock was perforce sown late, viz., 13th to 27th June.

The following were the average yields harvested from the greater part of the area, the remainder having been used for raising seed of a number of varieties which were sown in small areas ranging up to 4 acres:—

Marshall's No. 3 ...	16 bushels	24 lb. per acre.
Federation	14 „	42 „ „
Bunyip	16 „	8 „ „
Firbank	13 „	45 „ „
Comeback	17 „	53 „ „
Skinless Barley ..	30 „	14 „ „

Paddock No. 6, 68 acres, was ploughed in the spring of 1910, and lightly cultivated, when possible, with discs. Owing to compaction by the late summer and autumn rains, it became necessary to disc-plough it again in April, 1911—an operation we prefer to avoid when land has been fallowed, as better results are obtained when the cultivation, following the winter or spring ploughing, is as shallow as possible, provided that the ploughing and early treatment have been thorough.

The seed of Federation, the only variety used, was sown from 15th to 19th May, and the crop was rolled in August. The crop averaged 24 bushels 7 lb. per acre.

For sowing in this paddock, a quantity of grain was treated with lime-water, after the usual immersion in a 2 per cent. solution of sulphate of copper. The seed did not pass through the drills satisfactorily, a proportion of it being crushed, and the germination was far inferior to that treated with the bluestone solution alone. The portion of the crop resulting from the seed treated with lime-water contained some bunted grain which could not be found in that otherwise treated.

The highest yield in experiment plots was 29½ bushels per acre from a quarter acre; therefore, the above yield compares favourably, as the cost of manure was nearly six times greater on the experiment plot.

Paddock No. 7: *Malting Barley.* The paddock, which had borne a crop of wheat the previous season, was sown in May, the following average yields resulting:—

Goldthorpe	30 bushels	12 lb. per acre.
Gisborne	28 „	22 „ „
Kinver...	25 „	31 „ „
World's Champion ...	28 „	3 „ „
Golden Grain	26 „	28 „ „

The above results again tend to prove our statements that malting barley may be relied upon to yield profitable crops under any of the local conditions usually experienced, and to confirm us in our oft-repeated recommendation to farmers to include barley in their crops each year. Prices locally have ranged from 4s. 6d. to 4s. 9d. per bushel, the monetary returns, therefore, being far better than those obtained from wheat.

Paddock No. 3, 90 acres, wheat for hay. In 1909 this paddock bore a crop of rape, which was fed-off by sheep, and in 1910 a crop of grain was harvested from it. The treatment in the current season will be bare fallow.

The land was ploughed in January, and the seed (Zealand) was sown from 21st to 25th March.

The average yield was 1 ton 19 cwt. 0 qr. 6 lb. per acre. A portion of this paddock is low-lying land, over which there is a considerable flow of water whenever a fall of upwards of an inch of rain is recorded. The contour of the land prohibits the diversion of this water. This causes the soil to cake, and at the same time destroys a proportion of the plants, thus greatly reducing the yields. The higher land yielded up to 3 tons per acre, but the average was greatly reduced by the light crop from the lower area.

When harvesting the preceding grain crop, part of it was taken off by the combined harvester, and the remainder cut and threshed, and the stubble, about 6 inches in height, ploughed in. The stripped stubble was burnt, and it was noted that on this area the crop was shorter and thinner than that on exactly similar land adjoining, in which the short stubble had been ploughed in.

The Season.

The rainfall of 24·63 inches for the year is above the Wagga recorded average of 22 inches for over twenty years, and considerably above that of the Farm for the past fifteen years, which is 18 inches. The following are the details:—

	Points.		Points.
January	381	July	203
February	362	August	50
March	253	September	271
April	nil	October	26
May	262	November	242
June	257	December	156

For our purposes the distribution was very faulty, as the major part of the 743 points in January and February was injurious rather than beneficial, fallowed land being rendered unworkable to a satisfactory degree.

The growth of weeds throughout the district was excessive owing to the difficulty of the work of destruction, as if sufficient fine weather occurred to enable the machines to work, it would be followed by rain sufficient to replant and restore to a growing condition the weeds which had been displaced.

While the rains lasted the land was boggy, and this condition was followed by rapid baking of the surface on the reappearance of the sun. From all points of view, therefore, the conditions were unfavourable for fallowing, which can best be carried out when the rainfall is normal or light.

From the 20th March to 9th May no rain fell, thus producing conditions unfavourable for sowing after the compaction consequent on the excessive summer rains, as the soil would not run well behind the drills. This long-continued dry spell also militated against sowing at the best periods for the respective varieties.

The failure of the October rains affected district yields to some extent, as a reasonable distribution in that and the preceding month is essential to success. The demands on the crop at that period are greater than at any other, and the loss of moisture due to evaporation under rising temperatures has to be compensated.

The aggregate fall recorded from 1st May to 31st October—1,069 points—with a good distribution, especially in the latter month, would produce good crops; but its failure in March, April, and especially in October, has considerably reduced yields of grain.

It will be noted that, notwithstanding the very late dates at which we were obliged to sow Comeback, the crops were profitable, thus proving, as far as the evidence of one season may do, that the variety is one especially suitable for late sowing. At the same time the first week in June should, under normal conditions, be regarded as the latest suitable date.

CULTIVATION IN DRY AND MOIST CLIMATES.

THE University of Illinois Agricultural Experiment Station is preparing a soil survey of that State, and is issuing the results one county at a time. The main problems which are being dealt with are the improvement of the soil, and the conservation of fertility. Under the heading "Methods of Liberating Plant Food" we find:—

> Tillage, or cultivation, also hastens the liberation of plant food by permitting the air to enter the soil and burn out the organic matter; but it should never be forgotten that tillage is wholly destructive, that it adds nothing whatever to the soil, but always leaves the soil poorer. Tillage should be practised so far as is necessary to prepare a suitable seed-bed for root development, and also for the purpose of killing weeds, but more than this is unnecessary and unprofitable in seasons of normal rainfall.

So in the humid climate of Illinois, conservation of soil moisture is of so little importance that cultivation is actually condemned beyond strict limits. A contrast is afforded by this warm and comparatively dry State, where last year at Quirindi a cultivated fallowed plot gave 42 bushels of wheat when the district average was about 7 bushels (*vide* April *Gazette*, page 282). This shows how very careful we must be in attempting to apply the cultural experience of other countries to our conditions when there is much difference in the climate.

Wheat Harvest at Glen Innes Experiment Farm.

R. H. GENNYS, Manager.

HAYNES' Blue-stem wheat was chiefly grown for hay, and it is still considered the best hay-wheat for the district. The yield this year will vary from 18 cwt. to 30 cwt. per acre, according to the circumstances—early sowing being a big factor in producing high yields. The lowest yields for this variety were from land lately cleared, some of it being ploughed for the first time in June, and sown at the end of July. A good yield could not be expected, and the period was dry. Nevertheless a fair profit will be made on the hay, and a crop of clover sown with it has been grazed by sheep, and another feeding off will soon be available. The dry season was against Haynes' Blue-stem, as it is essentially a wet and cold season wheat, and should be sown early (about May in New England). It is a good stooler, stands frosts well, and is of high flour strength. Yield of grain, 22 bushels per acre.

For mid-season sowing, Genoa, Jonathan, and Cedar are recommended; Comeback for late sowing only. The following were the grain yields for these varieties:—

	bus.	lb.
Genoa	10	30
Jonathan	10	0
Cedar	14	17
Comeback	23	0

For grain the lighter soils of New England are best.

The heavy yield of Red Clover hay, some 30 cwt. to the acre from 21 acres of land (stiff black clay), after a straw crop the year before, emphasises that the following rotation is a good one:—

1. Wheat and clover.
2. Clover (second year's growth for hay and grazed).
3. Maize or potatoes.

The nitrogen element could be well maintained in this way, and abundance of organic matter returned to the soil by ploughing in the last growth of clover.

Relative to the sowing of Red Clover with wheat—the straw crop being of the first importance—it is advised to sow the Red Clover at the rate of 6 or 7 lb. per acre in the crop when rolling or harrowing takes place, about six weeks after sowing the wheat. Either rolling or harrowing will suit the clover, provided the seed is only covered very lightly. If both rolling and harrowing be practised in after cultivation, the procedure should be to roll, then sow clover, and then lightly harrow. In this way more moisture is conserved for the double crop.

In the ironstone outcrops the stump-jump plough was found to be very useful in locating the boulders, and avoided the breakages incidental to the first ploughing with ordinary ploughs.

Farmers' Experiment Plots.

EXPERIMENTS WITH OATS AND RYE ON THE SOUTH COAST, 1911.

R. N. MAKIN, Inspector of Agriculture.

THE oat plots this past season have varied a good deal—as was the case last season. Abundance rusted very badly along Illawarra, whilst in the Bega district it grew remarkably well, showing very little rust. So far, none of the varieties tried have proved themselves better than Algerian oats, as being generally suitable for the requirements of the dairy farmer.

In the variety trials, three plots of *Abundance* averaged 8 tons 5 cwt. per acre of green feed. Where this oat can be grown it is very useful. It is an excellent oat to feed-off. At Pambula a plot was fed-off four or five times, and then the crop allowed to run up. It carries very good flag, and runs up quickly in the early spring. I would not recommend this oat for any but the far southern coastal districts and the tablelands.

Bathurst Early is a very useful oat, earlier in maturing than Abundance, and if anything, carrying greater flag; otherwise it is similar to it in that it appears to suit the colder parts.

Cape and *Red Rust-proof* I would not advise planting again, as they are not at all suitable for South Coast conditions.

There were four manurial trials with Algerian oats. The yields of the manured plots were, in most cases, sharply contrasted with those of unmanured portions. At Dapto, the potash made a difference which was noticeable in the growing crop. The following are the returns:—

Experimenter.	Abundance.	Bathurst Early.	Algerian.			
			Unmanured.	Superphosphate, ½ cwt. per acre.	Superphosphate, 1 cwt. per acre.	Superphosphate, 1 cwt.; Sulphate of potash, 14 lb. per acre.
	T. c. q. lb.	T. c. q. lb.	T. c. q. lb	T. c. q lb.	T. c. q. lb	T. c. q. lb.
C. T. Styles, Bega	7 14 1 4	7 8 2 8	6 4 0 4	7 8 2 8	6 19 0 4	7 2 3 12
G. Lindsay, Dapto	....	....	3 8 2 8	3 10 11 24	5 8 2 8	6 1 1 20
Sir W. McMillan, Albion Park	. ..	....	2 10 0 0	4 0 0 0	4 5 0 0	4 18 0 0
J. Dobb, Moss Vale	8 0 2 0	. .	5 14 3 0	7 8 2 0	5 8 1 0	7 12 0 0
J. H. Martin, Pambula.	8 17 0 16	7 17 0 6	8 18 2 8	.	11 8 2 8	....
J. Chittick, Kangaroo Valley	4 11 1 20	....	..	...	. ..	....
L. Carr, Unanderra	....	5 12 3 12	7 7 0 16	....	..	....

Ryes.

Four complete experiments with four varieties of rye were carried out, and once more *Black Winter* has proved itself the best variety for coastal conditions. It is earliest and surest. *Emerald* is a useful variety, but is at least a month later than *Black Winter.*

Growing field-peas with rye is strongly recommended, and it is hoped that the coming season will see more experiments with field peas.

The following table shows the results of the plots:—

Experimenter.	Black Winter.				White.				Emerald.				Giant.			
	T.	c.	q.	bl.	T.	c.	q.	lb.	T.	c.	q.	lb.	T.	c.	q.	lb.
C. T. Stiles, Bega	8	0	0	0	4	5	3	24	5	6	2	16	7	0	3	20
Sir W. McMillan, Albion Park	7	11	0	0	.....				......				......			
J. Dobb, Moss Vale	8	6	0	0	....				....				....			
J. H. Martin, Pambula ...	2	17	0	16	3	2	3	12	2	5	2	24	2	11	1	20
J. Chittick, Kangaroo Valley	8	4	1	8	6	19	1	4	5	0	1	8	7	14	1	4
L. Carr, Unanderra	3	11	1	20	3	18	2	8	4	11	1	20	2	15	0	0

Six plots of *Black Winter* rye averaged 6 tons 8 cwt. 1 qr. per acre.

LUCERNE AND CORN FOR FARM WORK HORSES.

THE Illinois Experiment Station made some tests with working horses for about twelve months in order to determine the comparative value of several feeds for horses doing hard and medium farm work. The results are published in Bulletin No. 150 of that Station. They show that clover hay must be of good quality, and fed in limited quantity. Lucerne hay, however, gave good results, fed with corn, and it was found that less grain was required when this was used than when Timothy hay was used. The horses were fed as much of each feed as they required, and it was found that the lot fed corn and lucerne consumed 14·1 lb. cracked corn and 14·99 lb. lucerne hay per day, and practically maintained their weight. Those receiving Timothy grass hay required 4 lb. more grain per day. When a mixture of grains was used—corn, oats, oil meal, and bran—the results were still in favour of lucerne hay and corn only. At no time during the test were there noticed any deleterious results from feeding lucerne hay. The horses ate it with more relish than Timothy, and it did not prove to be as loosening to the bowels as clover. Grinding the corn saved about 10 per cent. of it. Whether it will pay to grind corn for horses depends upon the cost of grinding, condition of the horses' teeth, and extent of work, as ground corn is slightly more digestible. When the labour is light the saving is not so great as when it is heavy.

Mixed Farming in Riverina.

J. E. O'GRADY.

In the *Royal Agricultural Society's Annual* for 1911, Mr. W. M. Sherrie, writing under the above heading, has given a collection of opinions from local farmers as to the best means of utilising the soil. Amongst those who contributed to the article was Mr. Ernest Field, Wave Hill Farm, Coolamon. It was suggested to Mr. Field that a more detailed sketch of his operations would probably be useful to farmers in various parts of the wheat country. The following was his reply:—

> The subject of your letter is one with which I should very much like to fall in, not for any personal aggrandisement, but if my experience is of any value to you to give to the farming community, you are very welcome to it. I have been for years a strong advocate of closer settlement in the true sense of the word; and, having started from the bottom rung of the ladder, I have been working up and up with a fair measure of success. My sympathy is with those who are making a start under similar conditions, and you are very welcome to any information which I can give.

Mr. Field learnt his farming in the Orange and Molong districts, and had some experience in New Zealand. At the ballot for closer settlement blocks of the Gobbagumbalin subdivision in 1907, he secured some 600 acres of rabbit-infested pastoral country, 7 miles from the township of Marrar, on the railway between Junee and Narrandera. The rainfall is 20 inches, the wettest months being those of winter and early spring. His capital was very small, and the work of clearing the land of timber and rabbits was a big task. The farm averaged eight rabbits per acre. These were all killed off and their burrows destroyed; the whole farm was wire-netted in; and all hollow logs or other harbours for the pests were removed. The result has more than justified the expense. Apart from the protection to the growing crops, the grazing land is improving 20 per cent. each year, and well known grasses which were thought to have been exterminated by the rabbits are growing and seeding again. Last spring was rather dry for the pastures, but the heaviest coat of grass which Mr. Field has seen since he took up the farm was produced. Mr. Field has never employed more than one man on his farm. The scarcity of reliable agricultural labour has affected him as it has affected others.

During his first two years on the farm, whilst destroying rabbits and clearing the land for the plough, Mr. Field maintained himself and family by milking nineteen or twenty cows. Sorghum, pumpkins, and other crops were grown to provide summer feed. Dairying has now been abandoned—it served its purpose, but is not as profitable as wheat-growing under the conditions of the district. Only a very few cows are milked now.

The farm is devoted mainly to wheat, grown after a cultivated fallow, but sheep are kept to break down the stubble, clean the fallows of weeds, and graze upon the portion of the farm which is unfitted for cultivation. An orchard of 7 acres has just come into bearing, whilst pigs, fowls, and turkeys have been tried and have proved profitable. Mr. Field follows certain definite principles in his work. As he has already reached a position of comfort and personal independence, his stock, implements, home, and farm buildings being all his own, and the land having been improved very much in value, his advice may be regarded as that of a successful man.

Fallowing.

Mr. Field relates an early experience as follows:—

> The first year I was here, I was going to fallow 100 acres of new land. After ploughing, however, I thought it advisable to put in 30 acres of it with crop, as wheat was a fair price, and other farmers were still sowing. I sowed the wheat at the end of June, even going a few days into July. It gave me 5 bags to the acre. The following year I sowed that same 30 acres, as stubble land, in May, and it gave me about 8 bags. The other 70 acres were fallowed, and gave me 13 bags per acre in the one crop, being sown, of course, in May. I consider that I lost heavily on the 30 acres. Besides wearing out my paddock, I had a lot of extra work in order to get in two crops what the other land gave me in one. I do not believe in sowing new land before it has lain fallow, and it can only be justified in the case of a man just starting and wanting money as early as possible.

Farmers generally take three crops running from new ground without fallowing. Mr. Field does not agree with this practice. Moreover, the disease known as "take-all" is very common in third-crop stubble land, whereas fallowing almost destroys it.

After three crops are taken, a common practice is to let the land go out for three years and devote it to grazing. Mr. Field considers fallowing gives better results, and he pointed to the conditions at the time of my visit (middle of March). There had only been 76 points of rain since the beginning of the year. Graziers, as well as those proposing to sow stubble land, were anxiously watching the sky, whilst farmers with fallowed land would not need rain until the beginning of May, when they could drill in their wheat without delay.

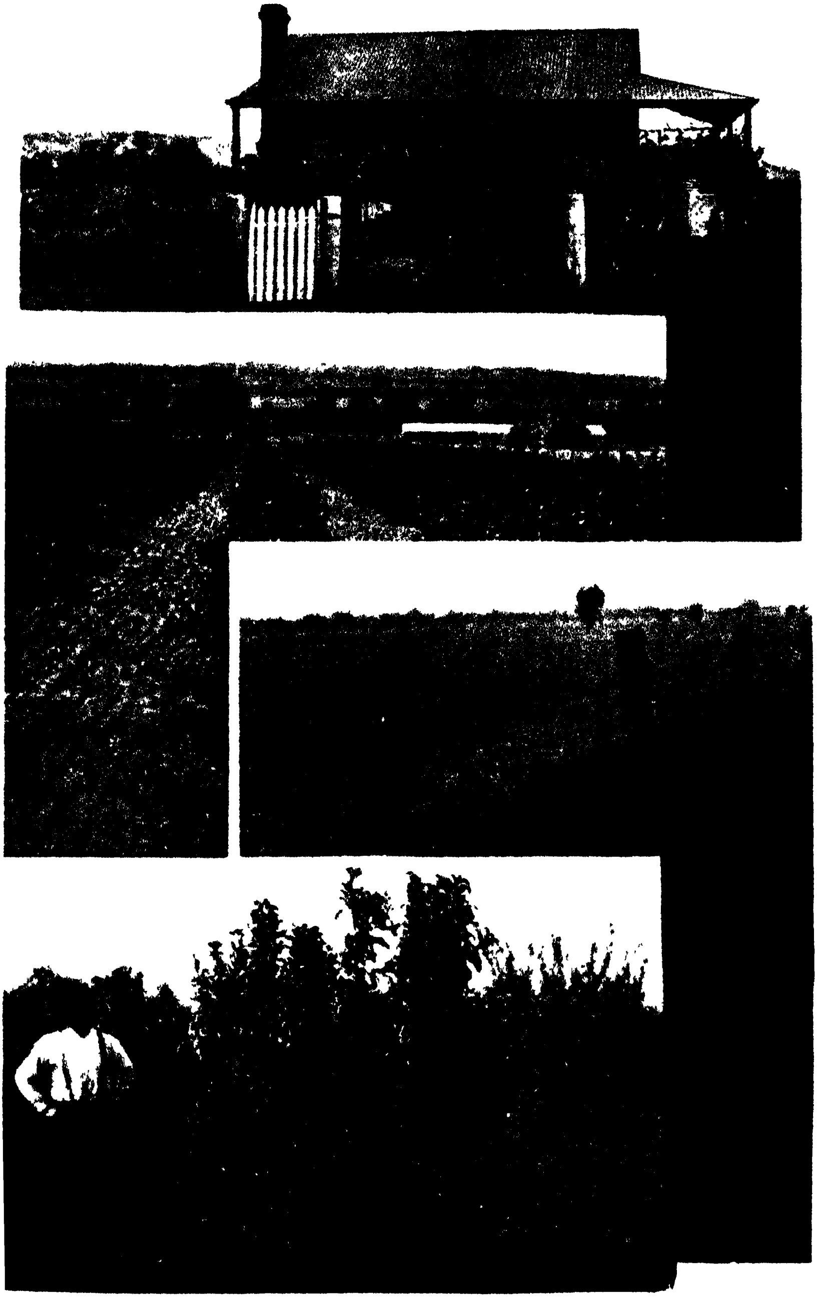
Wave Hill Farm is therefore divided into two main sections. Last year some 290 acres of wheat were grown on fallowed land; this year 220 acres are fallowed for sowing with wheat. No stubble land will be sown.

Treatment of Stubble.

Another early experience determined Mr. Field's line of action in this respect:—

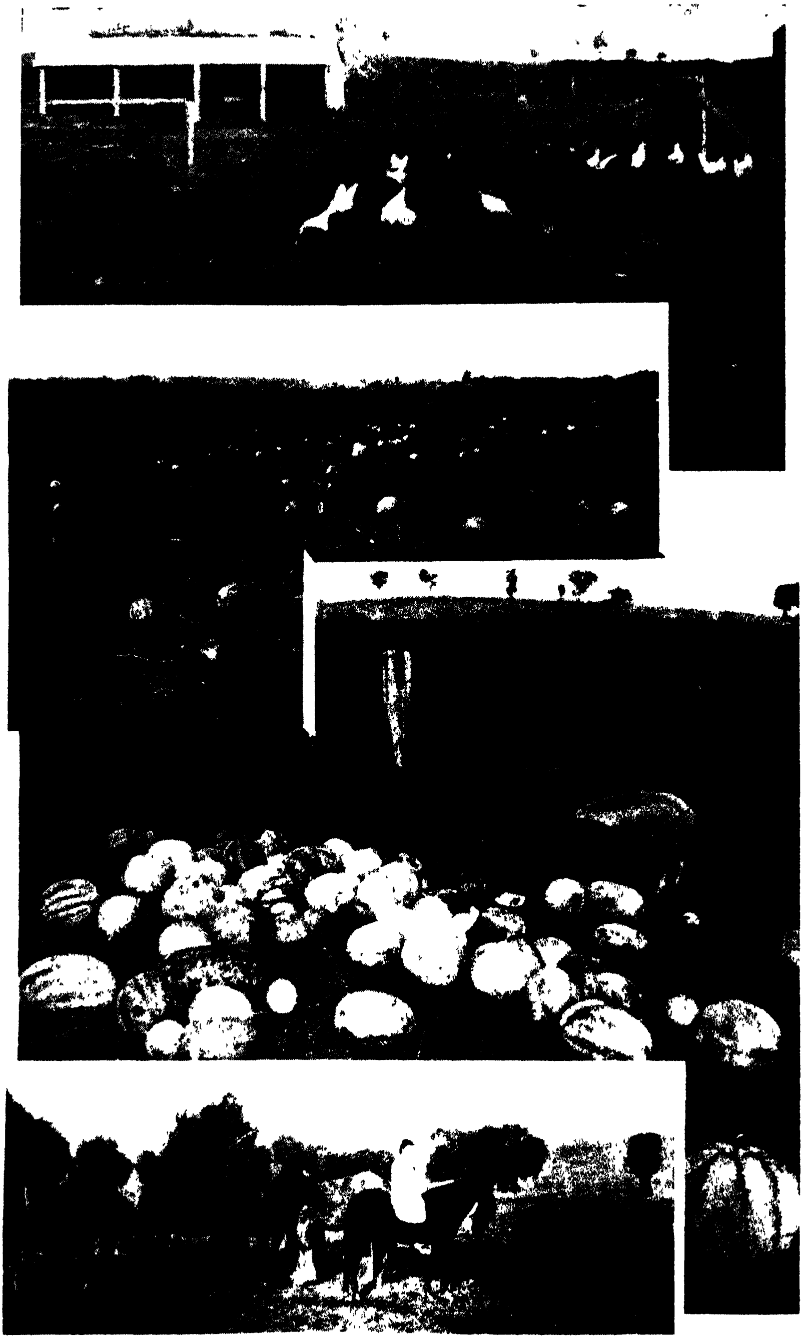
> My first crop on Gobbagumbalin was harvested with a stripper; the stuff was shot out of the machine and winnowed on the ground. A heap of beeswing chaff remained. I carted some away, but spread a lot of it out and ploughed it in. The result was that the next crop of Federation wheat on that patch stood actually 2 feet higher than on the rest of the paddock, and showed a beautiful big head. Since then I have always ploughed in my stubble.

An agricultural chemist could have told, by analysing the soil, that it was deficient in "humus." Mr. Field learnt the lesson from the paddock, and has made it part of his system of farming. Stubble is always ploughed in at Wave Hill.



1. The Cottage Homestead, Wave Hill Farm, Coolamon. 2. The Vineyard. 3. Fallow and Stubble. 4. Winter Pearmain Apple-trees, 4 years old.

MIXED FARMING IN RIVERINA.



1. Fowls and Turkeys, Wave Hill Farm, Coolamon. 2. A Self-sown crop of Pumpkins and Melons. 3. Pumpkins, Melons, and Pigs. 4. Waiting for breakfast.

MIXED FARMING IN RIVERINA.

In order to break down the stubble, sheep are grazed upon it. If necessary, they are driven about with dogs, so that they trample it down well. Failing this, a long log is drawn from both ends over the ground. Harrows turned upside down are useful, but rather dangerous to the horses. Then, after the season's sowing is completed, the stubble ground is ploughed with mould-board plough, fitted with disc coulters. The ploughing is done from June to August, and as there are usually good rains about this time, the coulter cuts through the stubble easily, and it is successfully ploughed in.

Working the Fallow.

The land is left as ploughed for a month or six weeks and then harrowed down. Rain generally comes in winter and early spring, but October is usually rather a dry month, and the land is harrowed before it gets too dry. The harrowed surface is left until the spring weeds come up, when a spring-tooth cultivator is used to destroy them. It is usually run over the paddock both ways, as this gives a better result. After the spring weeds are gone no implement is used except a wide harrow, unless a further crop of weeds appears in the autumn, when the cultivator may be used again.

Mr. Field does not favour the disc cultivator. He considers that this implement tends to press the clods into the ground, leaving the fine soil on the surface -an undesirable condition. The spring-tooth, on the other hand, lifts the clods to the surface and allows the fine soil to form the seed-bed below.

The harrow is used after rain, as soon as it is possible to get at the land. The fallow may be harrowed and cross-harrowed six or seven times, if other work will permit. "There is nothing," says Mr. Field, "which can beat a good wide stretch of harrows for summer cultivation. The cultivator leaves the ground with too much surface exposed, and is only advisable when weeds have to be destroyed." Sheep will also eat all the weeds which grow there, and it is often an advantage to run them on the fallow for a while in dry weather.

During the last harvest, 2 inches of rain were received. This was regarded by farmers who work their fallows as a matter for deep regret. Mr. Field, for example, could not leave his harvesting to harrow the fallow after the rain, and he considers that he lost most of the benefit of that rain—a serious loss in view of the long dry spell which followed.

Sowing.

Reploughing before sowing is not considered advisable. As long as 2 inches of the surface soil are loose, Mr. Field would never plough the second time.

The hoe drill is preferred to the disc, as it loosens the soil and throws it both ways, and so acts as a cultivation. In case the ground has set through rain since the last harrowing, and before sowing, the disc drill does not, in Mr. Field's opinion, leave it in as good condition as the hoe.

This year, as usual, the wheat will be sown in May, whether it rains or not. In case the dry spell continues right into May, it is very unlikely that there will be sufficient moisture near the surface to germinate the wheat, though of course there will be a good store below, and if only a light shower of rain comes soon after sowing, the grain may sprout and die. To get over this danger, Mr. Field always keeps sufficient seed on hand to make a second sowing if necessary.

The varieties grown for grain are Federation and Bunyip. Mr. Field prefers Federation as the best yielding wheat. He would sooner grow it for 3s. per bushel than one of the stronger wheats for 3s. 6d., as it yields so well. He purchases fresh seed every two or three years from the Wagga Experiment Farm, as he considers this undoubtedly the best seed to be obtained in the district. He sells a lot of his own wheat for seed, this being one generation removed from the seed supplied by the Government Farm. In any case he never sows any but graded seed.

Superphosphate is always used, 40 lb. per acre on new fallow, and 56 lb. per acre on old.

Wheat Yields.

The year before last, Mr. Field received 32 bushels per acre from 330 acres. Last year, 130 acres of his crop, in a low-lying position, were touched with frost, so that the average for the year was reduced to 24 bushels. A neighbour working fallowed land, but whose crop was not frosted, took 30 bushels per acre last year. It may therefore be assumed that, barring accidents such as frost, a farmer working on this system may expect an average crop of about 30 bushels per acre each year from half his farm. This is a very satisfactory yield, for though it is obtained only every second year on the same ground, it is obtained with one ploughing and one harvesting, and in a manner which enables a man to work a considerable area of land without much hired labour.

Other Cereal Crops.

Mr. Field only grows sufficient hay for his own use, as the nearest railway station is 7 miles by a rough road. The variety which he uses is Firbank, and he has already given his experience with the variety in April *Gazette*. In addition, it is a good variety to grow in case rape is to be sown for sheep in the following February, as it is so early that the ground can be ploughed after it in November. On one occasion Mr. Field ploughed after Firbank in November and gave the land a partial fallow, sowing wheat in May. This gave 30 bushels per acre, and he would adopt this system if he had a farm in such a position that he could not fallow and graze sheep.

Oats do well in the district, and Mr. Field grows sufficient for horse-feed. Their value as a change crop to overcome "take-all" is very evident from the appearance of a portion of one of his paddocks at the present time. One section, which grew two crops of oats, is quite clean, whilst the adjoining land, a small section, on which were sown three crops of wheat running, shows large brown patches of "take-all" in the stubble. The two oat crops gave 65 and 45 bushels to the acre respectively.

Sheep.

It will be seen from the above that sheep are very necessary upon a farm worked on such a system as this; in fact Mr. Field considers that a farm in Riverina is hardly a farm at all without sheep. He has 200 on the property now, running on the stubbles. They are cross-breds. For the first three years Mr. Field bred sheep, but lately he has gone in for buying and selling only. At any time he may return to breeding. In order to breed sheep it is necessary to provide feed all the year round, and particularly for lambs. Growing rape is sometimes impossible in a dry year, and taking all things into consideration, he is doubtful whether sheep-breeding pays in his district, as against stocking up when feed is available and disposing of the sheep when market prices are suitable and they are no longer required in connection with the wheat work.

Mr. Field has taken the precaution to leave a reasonable number of shade trees in his paddocks for the sheep. These are mostly yellow box; but he is raising and planting out a lot of kurrajongs as well, as these are more pleasing to the eye, and will also yield a considerable amount of fodder if the seasons should happen to be so bad as to make it valuable.

The trees left standing for shade have all the surface roots run, so that only the tap roots are left. They are also "lopped" off, 10 feet from the ground. Mr. Field considers that the manure which the sheep leave around the trees compensates for the injury done by taking moisture from the soil, so that the trees make no appreciable difference to the yield of wheat. The trees also add materially to the appearance of the farm.

Fruit.

The orchard is now in its fourth year. There are 6 acres of apples, prunes, peaches and plums, and 1 acre of grape vines. Mr. Field would extend the orchard considerably if labour were available, and would leave out apples, growing mainly sultanas and prunes

All the stable manure is carted into the orchard for use as fertiliser and mulch, and the young trees have been watered three times this year. For the rest, the orchard is cultivated in the same way as the rest of the farm. It is ploughed up once a year, and worked well with spring-tooth and harrows during spring and summer. The beneficial effect of the cultivation is very striking, and there is certainly nothing in the appearance of the orchard to reflect the dry season through which it is passing. The leaves are dark green and healthy-looking; the trees are well grown and bearing well; and the fruit is ripening in the ordinary course. People come from miles around for the fruit, and the 7 acres seem destined to prove a great financial success.

Mr. Field is grateful to the officials of Wagga Experiment Farm for advice received in this and other respects. "I have got a lot of valuable information from the Government Farm," he says, "and I have always found them ready to give it." All the varieties grown are such as can be dried in case they cannot be sold in the fresh state.

Pigs.

The scarcity of labour also prevents Mr. Field from going in for the breeding of pigs; but he finds it very profitable to buy young ones and rear them for sale. He purchases them at the age of 2 months for 6s. or 7s. per head. He has a small paddock of lucerne, now in its third year, and this supported ten pigs per acre during last spring. After Christmas the lucerne failed to make any growth in the very dry weather, but Mr. Field has a large supply of self-sown pumpkins and melons from another paddock, and these are being fed to the pigs. When they require to be "topped off," cracked grain is used. They are usually sold as "slips" to neighbouring farmers. This section of the farm is not capable of much extension, owing to the labour involved, but it has proved profitable.

Poultry.

For information on this subject I was referred to Mrs. Field. This lady, an ex-school teacher, took the very sensible step of making herself acquainted with the arts of canning and bottling fruit, and managing poultry, in addition to the usual accomplishments, before she became a farmer's wife. The wisdom of her action is reflected in what promise to develop into several very profitable side-lines. On a wheat farm there is a large amount of feed available for poultry, both in the grain-room and in the paddock, which would otherwise be wasted, but which fowls and turkeys can turn to good account.

A flock of 100 white Leghorn fowls was raised, but this breed proved unsuitable. The Leghorns are egg-layers only, and it was found that eggs could only be marketed at a profit when prices were high, which, of course, occurred when the eggs were scarce. Preserving the eggs in water-glass for sale to pastrycooks in time of scarcity, also proved a failure, owing to the pastrycooks themselves resorting to the same practice with cheap eggs. The Leghorns are, therefore, being killed off by degrees, and replaced with Orpingtons, which are winter layers, and also good table birds. The change promises to be a profitable one, and the poultry section will soon contribute well to the income of the farm.

About 100 turkeys have been bred on the farm, and are allowed to wander all over the property during the day. As the farm is wire-netted in, they cannot get out of bounds, and they return regularly at night, after the habit of these birds.

The young turkeys are reared on curd made from milk. Turkeys are also particularly fond of melons, which are cut up for them, and supply the succulent feed which they appear to require in order to thrive well.

Mr. Field considers that it pays every farmer to keep turkeys in large numbers, especially where grasshoppers are likely to be bad. Last summer the turkeys completely freed the farm of millions of small hoppers which were to be found in patches waiting to take wing and commence their work of destruction. Not only do turkeys clean the farm of insect pests, but for destroying young weeds on the fallow they almost rank with sheep.

In the market they fetch 5½d. per lb. Many of them are sold to the agent of a well known Sydney restaurant, where Mrs. Field's protégées gratify the appetites of epicures who seldom concern themselves with the summer droughts and winter rains of Riverina.

Conclusion

Mr. Field has twenty-one head of horses on his farm, and he raises a few foals each year, selling off the older horses as the young ones come on. He has a few hives of bees, kept for orchard fertilising purposes and to supply household requirements; and this concludes the main lines upon which he is developing his system of Mixed Farming in Riverina. Already the results are financially successful; and it must be remembered that this is being done on what five years ago was second-class pastoral country, swarming with rabbits, and incapable of supporting a sheep to the acre all the year round. He has also made a home which is noted in the district for its attractive appearance; and, looking down upon the farm from the hill from which it takes its name, one can feel that, even in bad seasons, Australia will be made a good country, and is safe in the hands of those who are working the change. What is developing now in Riverina will develop in the west and north, where it *does* rain in summer.

It was very dry in Riverina during March—76 points of rain in three summer months. Old hands laughed when you called it "drought," and said, "You do not know Riverina; it may not rain till June, and still the crops will be good!" But they are wise farmers who have conserved their "bank balance of moisture in the soil." From the hill-top one could see immense stretches of dry, whitened grass and stubble, intersected by dusty roads; but the landscape was dotted with bright orchards and vineyards, loaded with fruit; and on the red fallows, dark green weeds, the index of moisture below, were struggling with the cultivator for place. Whatever may be said or written of the so-called "dry farming methods" in other countries, in our own Riverina they are a brilliant and unqualified success.

WESTERN AUSTRALIAN BULLETIN ON POULTRY.

BULLETIN No. 23, Stock Division, Western Australian Department of Agriculture—"Poultry," by Geo. Allman. This is another general booklet on poultry-keeping, dealing with the subject in the usual way. It has a number of illustrations, and runs to forty-four pages. There is a good deal of information and a number of pictures of the colony system of raising fowls. Poultrymen who like to have all authoritative publications obtainable on their shelves (and this should be the aim of all) are advised to include this one.

Bulk Handling of Wheat.

THE Department of Agriculture is continuously collecting all available information on this important question, and a new edition of Farmers' Bulletin No. 13, by Mr. H. V. Jackson, is now in the printer's hands. Meanwhile, the following summary of information contained in the official papers since the first edition of the Bulletin was issued should be of interest to farmers.

The Views of the Farmers of New South Wales.

From discussions at the Wheat-growers' Conference, Sydney, July, 1910, consisting largely of delegates from the Farmers and Settlers' Association of New South Wales, it is evident that the farmers of the State are very desirous that bulk handling of wheat should be introduced. Their chief reasons appear to be that it would save the cost of bags, and that grading would be a corollary, which they consider better than selling on the f.a.q. standard.

In addition to the unanimous resolution of that conference, the annual conference of the Association in July, 1911, passed another resolution: "That the Government be urged to at once make provision for the bulk handling of grain, and the establishment of graders, as the present method of handling and disposing of grain, in addition to saddling the producer with an enormous unnecessary expense, is decidedly unfair to the farmer in regard to the disposal on the f.a.q. basis."

A deputation from the Farmers and Settlers' Association waited upon the Colonial Treasurer on 20th July, 1910, to urge the adoption of bulk handling. The main arguments used at this deputation were: (1) Increased production necessitates more expeditious handling; (2) bulk handling enables the wheat to be conveyed more cheaply; (3) the wheat would arrive in better condition; and (4) there would be less risk from bush fires, as grain would not be left standing in the paddocks.

Shipping Accommodation.

The Colonial Treasurer promised the deputation from the Farmers and Settlers' Association on 20th July, 1910, that information would be obtained as regards insurance on wheat carried in bulk, and the capacity of the vessels trading here for carrying wheat in bulk. The Department of Agriculture thereupon communicated with shipping companies and insurance offices to obtain such information.

Ten shipping companies replied to a circular from the Department of Agriculture, asking whether they would be prepared to provide accommodation for the carriage of grain in bulk to Great Britain, what quantities they could take in a given time, &c. None of the companies were prepared to accept grain in bulk for carriage by sailing vessel, but four large steamship companies expressed their willingness to take full or partial cargoes, and three others had to refer the matter to their Home offices. Three stated that their vessels were not suitable for the purpose.

Of the companies consenting, one stated that wheat in bulk could only be taken in the refrigerator space, and only when frozen cargo was not available. The difficulty of carrying it in ordinary cargo space was that the holds would have to be lined to prevent "sweating" by contact with the steel or iron. Another company could take parcels from 500 to 1,500 tons dead weight on their regular steamers, and had also special cargo boats available for charter for full cargoes of 6,000 to 8,000 tons. A third company could carry grain in bulk when space was available, but was not likely to want it, as frozen cargo restricted the space. The fourth company simply stated that their steamers were available to carry bulk grain, and that insurance was obtainable upon such cargo carried by their boats. The other offices, however, referred the Department to the insurance companies for information upon the question of insurance.

Insurance.

Following the deputation from the Farmers and Settlers' Association to the Colonial Treasurer on 20th July, 1910, the Department of Agriculture communicated with the Sydney Marine Underwriters and Salvage Association, Limited, asking for information as regards insurance on bulk shipments of wheat. The reply received was that the matter was one for individual offices. A circular was then sent to a dozen of the leading marine insurance offices in Sydney, asking: (1) Is insurance likely to be obtainable on bulk grain cargoes per sailing vessels from Sydney to the United Kingdom; (2) is insurance obtainable at the present time on a bulk grain cargo per steamer; (3) is there likely to be any difficulty in obtaining insurance on bulk grain cargoes shipped per steamer to the United Kingdom in the future, upon the introduction of bulk handling of wheat?

The following notes are condensations of the replies received:—

(1.) This firm do not underwrite here. Their London office, upon being communicated with, replied that they could not get any quotation for such insurance. At their instigation the leading underwriters at Lloyds for grain insurance referred the matter to the committee to see if a scale of rates could be arranged, but the committee did not consider it advisable for grain to be shipped in bulk for such a long voyage. The firm discussed the matter with various underwriters at Lloyds, who all declined to quote, though some might quote for a named vessel if they had full particulars as to shifting-boards, &c. No grain was shipped in bulk from San Francisco, because it was considered unsuitable, and they thought the same reason would apply to Australia.

(2.) The matter would depend upon the class of vessel, ownership, and arrangements made on board concerning stowage, &c.

(3.) Not prepared to accept risks on bulk cargoes of grain by steamers or sailing vessels.

(4.) This firm saw no reason why the cover should not be obtained for shipments of grain in bulk from here as from other countries, provided the same rules were observed, and offered to quote for a particular ship. They were writing to their London office and representatives in wheat-growing countries where ships were loaded in bulk by elevators for information and particulars, and promised a further letter in about ten weeks time. No further letter was, however, received.

(5.) The company does not insure "full cargoes" of grain, so cannot supply the information.

(6.) Insurance might be obtainable at a high rate, but the company are not prepared to entertain the business.

(7.) Very little insurance per sailing vessels wholly laden with wheat is now placed in the States, almost the whole risks being placed with Lloyds, London. Steamer cargoes have been more profitable, and it is not thought there would be any substantial increase in premiums on bulk shipments in good steamers, provided bins were built in to prevent shifting of cargo, and the loading carried out to the satisfaction of the marine surveyors.

(8.) This company would not underwrite this class of business, and thought there would be some difficulty in obtaining insurance.

(9.) No office would touch sailers except at "fancy rates." This company would not cover grain cargoes in bulk in them under any consideration. For steamers, they would take lines of £2,000 provided the cargo was stowed and dunnaged to the satisfaction of the underwriters' marine surveyors.

(10.) Cannot entertain a proposal, either for sailing vessels or steamers.

(11.) Impossible per sailing vessels; should be obtainable per steamers, provided the steamer was good and the amount not too large.

(12.) No insurance would be obtainable per sailing vessel either in Australia or in London. Per steamer there would be no difficulty, provided care was taken in stowage. The class of steamer would affect the matter, and would largely govern rates.

Handling Wheat from Paddock to Elevator.

In the *Sydney Morning Herald* of 14th January, 1911, Mr. G. W. Walker, of Sydney, published a letter from an American firm of grain elevator constructors (unnamed), stating that a small farm elevator is not necessary. In America, where wheat is kept in bulk on the farm for any considerable period, the farmer shovels it out of his waggon into the grainery. The present Australian system of harvesting and bagging should be retained up to the receiving elevator, the bags being then returned to the farm. The change should commence at the receiving elevator.

This firm desire to be retained as designing engineers for the bulk-handling system.

Growth of Canadian Elevator System.

Mr. D. H. Ross, Canadian Trade Commissioner, Melbourne, has supplied an official map showing the grain elevators in Manitoba, Saskatchewan, and Alberta, with the total capacity of each; also the flour, feed, and oatmeal mills. The map was published in 1910. Mr. Ross has also supplied a list of the licensed elevators and warehouses for the season 1909-10. In 1909-10 there were at 788 railway stations 1,802 elevators and 38 warehouses, with a capacity of 94,266,100 bushels. In 1910-11 there were at 863 railway stations 1,909 elevators and 32 warehouses, with a capacity of 105,462,700 bushels.

Canadian Grain Trucks.

Mr. Chas. C. Castle, Chief of the Manitoba Grain Inspection Division, Winnipeg, Canada, writing to Mr. Walker on 21st November, 1911, states that the box cars used on various Canadian railway lines are 40,000, 60,000, and 80,000 lb. wooden-frame cars, and 80,000 lb. steel-frame cars, the tare being 26,500, 30,000, 38,000, and 36,500 lb. respectively. The last-mentioned car is built entirely of steel except the sides, ends, and platform, which are sheeted with lumber bolted on to the steel frame. The holes in the steel frame for the bolts are slotted, so that the bolts have a certain amount of play in the event of a take-up being necessary owing to shrinkage in the lumber. The cars cost from $700 to $950. The 60,000 lb. standard car is considered most satisfactory by the railway companies. It measures inside 36 feet long, 8 feet 6 inches wide, and 8 feet high, and, when loaded to capacity, the grain wheat stands about 52 inches high, the car being double-lined to that height, and, above that, single lined only. The cars may be loaded 10 per cent. over the stencilled capacity. Flat cars are very little used on the railways, and then only for cord-wood, building stone, heavy machinery, long squared timber, and ballast.

A standard grain train leaving Winnipeg comprises one locomotive, sixty-five loaded box cars, and one caboose, or conductor's van. It can be taken to Fort William or Lake Superior, 425 miles east, without breaking the train up. The cars are inspected, in the busy season, at the rate of over 1,200 per day. The first week in November, before the maximum was reached, 7,233 cars, or 7,739,310 bushels of wheat, were inspected.

From the terminal elevators at Fort William and Port Arthur during the week ended 27th October, there were shipped 4,900,000 bushels of wheat, 750,000 bushels of oats, 160,000 bushels of barley, and 12,000 bushels of flax.

How Great Britain Receives Wheat.

Mr. Herbert M. Gibson, Chief Traffic Superintendent, Manchester Ship Canal Company, writing on 23rd August, 1911, states that the following countries ship their wheat as indicated:—

India.—At present always in bags; but the Indian Government is inquiring into the question of elevators.

Australia.—Always in bags; but the Australian Government also has been inquiring *re* elevators.

River Plate.—Both bulk and bags—usually 10 per cent. bags for stiffening purposes. The tendency is towards bulk. The main holds have "feeders," but in the after and forward holds bags are stowed on top of bulk wheat to prevent shifting.

Russia.—Practically all bulk, except a little bagged for stiffening purposes.

San Francisco.—Always in bags.

United States and Canada.—Usually in bulk. Full wheat cargoes are rare, the regular liners bringing parcels of 1,000 to 3,000 tons per steamer in bulk, and the balance of the cargo being package freight.

This letter was forwarded to Mr. Walker by Messrs. John S. Metcalf Co., Limited, Grain Elevators, Montreal, Canada, who offer the opinion that on the opening of the Panama Canal most of the wheat from western United States and Canada will go in bulk. At London, Leith, Bristol, Liverpool, Manchester, and Glasgow, grain is being handled in bulk in very large quantities. Glasgow has just contracted for a large bulk elevator. At the ports of Manchester and Glasgow, at least, special railway waggons for transportation of grain in bulk have been built. Messrs. Metcalf consider that, rather than fear that Australian grain will be at a disadvantage on arrival in Great Britain in bulk, the less cost of handling bulk grain from competing countries will be to our detriment unless we adopt the bulk system. An eminent Japanese engineer was then in Montreal investigating grain elevators with a view to erecting one to deal with the export of soy beans from Manchuria to Europe.

Further Inquiries in Canada and United States.

On 19th September, 1911, Mr. Waddell, M.L.A., asked the Premier whether he would obtain the services of a Canadian expert to examine our conditions and report upon the desirability of adopting bulk handling. The Premier replied that he thought it better to send an officer of the Department of Agriculture to investigate Canadian and American methods; and that the Government would consider whether this should be done.

TRIALS OF ALLEGED PREVENTIVES FOR SMUT IN WHEAT.

LAST season two specifics which were claimed to have virtue as preventives of smut (bunt) in wheat were tried at Cowra Experiment Farm. The following is a summary of the reports received:—

Corvusine.—This preparation was compared with bluestone (2 per cent.) and lime-water. It was found that Corvusine was not as effective as bluestone and lime as a bunt-destroyer, whilst it affected the germinating power of the wheat to a greater extent. It cannot, therefore, be recommended.

Clarke's Carbolised Wheat Protector.—This was found to be as effective as bluestone and lime as a bunt destroyer, but it affected the germination of the wheat to a much greater extent. Similar results were obtained at Wagga and Bathurst Experiment Farms; consequently, this preparation cannot be regarded as being equal to bluestone and lime.

Weevils in Corn, Wheat, and other Stored Grain.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

So many inquiries are made every year regarding the best methods of dealing with weevils in grain, that the following brief notes have been prepared :—

The true grain weevils that do so much damage to grain are reddish-brown, hard-cased little beetles, that lay their eggs in the grain, puncturing the skin of each seed, and depositing the egg *in* the grain. This may occur in the field where the maize is growing, or in the harvested cobs, but usually when the corn is in the bag.

Wheat is not attacked by weevils until it is bagged and stored. Not only are all the produce stores, mills, and granaries more or less always infested with these destructive beetles, but many of the farmers' sheds and stores are swarming with weevils, so that it is very easy for maize and wheat to become infested if the grain remains unused for any length of time.

The weevils must get access to the material before it can become "weevily," though the eggs and larvæ may remain for months undeveloped, and not apparent in the maize or wheat. When the grain becomes the least bit damp and heated, the dormant larvæ develop rapidly, and the perfect beetles eat their way out, swarming through the maize or wheat, and laying their eggs in the rest of the sound grains. In the course of time every grain is reduced to a shell, decay sets in amongst the damaged material, and it becomes a fermenting mass, or, in dry situations, a bag of dust, damaged seeds, and dead weevils.

The habits and life-history of the two common grain weevils, *Calandra oryzæ* and *C. granaria*, popularly known as the "rice" and "grain" weevils, are well known. First comes the egg, next the active destructive grub, then the pupal form inside the grain from which the perfect beetle is developed. The length of life in the different stages of development is so much regulated by the natural surroundings and climatic conditions, that the information is so variable as to be of little or no value in dealing with the pest.

If our grain were harvested under clean conditions into clean bags, where there was no weevil existing, and stored where there was no weevil, it could not become infested with the eggs, and would remain intact, and never become weevily. Unfortunately these conditions are so rare that we seldom find the softer varieties of maize or wheat not infested within twelve months when stored.

Preventives and Remedies.

Clean up all rubbish, waste grain, &c., on the farm, and in all places where grain is stored. Fumigate with some chemical to destroy the weevils among the grain. Bisulphide of carbon is a strong-smelling, inflammable fluid, evaporating into a heavy gas that sinks down through any material and kills all insect and animal life.

The method of fumigating with this chemical is to place the infested grain upon a solid floor, built round a dish into which the fluid is poured through a pipe or tube, inserted from above. The pipe can then be withdrawn. The stack is then covered with a tarpaulin or sheet and left for twenty-four hours. Next morning the grain is turned over, and [the fumes remaining are soon blown out.

One pound of bisulphide of carbon used in this manner is sufficient to kill all weevil in 100 bushels of grain. It does not injure the milling qualities, and the germinating power is not injured under an exposure of thirty-six hours. If prompt measures are taken when weevils first appear in wheat, the infested bags may be turned out and the contents run through a winnower. All the beetles are blown out with the dirt and dust, where they can be gathered up, bagged, and burnt. Though the grain may be slightly damaged it can be used, and is saved from reinfestation by the fresh generation of weevils.

The great precaution in stores and mills is the cleaning up and destruction of all infected material, dirt, rubbish, and old bags. When a building is fumigated, 1 lb. or 2 lb. of bisulphide of carbon is sufficient for every 1,000 cubic feet of space. If the chamber or room can be made air-tight, the grain can be fumigated in the chamber.

TREATMENT OF SEED WHEAT FOR SMUT.

UNDER instructions from the Experiments Supervision Committee some tests have been made in the Chemical Laboratory and in the Bureau of Microbiology to ascertain the effect upon the germination of wheat of using bluestone at less strengths than the 2 per cent. solution hitherto recommended by this Department. Trials were made with ½ per cent., 1 per cent., 1½ per cent., and 2 per cent. solutions, and the effect of dipping the wheat in lime-water after using bluestone was also ascertained.

These germination tests showed that any solution of bluestone stronger than 1½ per cent. is likely to seriously affect the germination of the grain. Even when 1½ per cent. solution is used, it is advisable to dip the wheat in lime-water afterwards, as otherwise the germination is seriously affected. The lime-water recommended is a mixture of 1 lb. lime and 20 gallons of water

The experiment is now being carried to the Experiment Farms for a field trial to ascertain how far these weaker solutions of bluestone may be regarded as efficient destroyers of bunt. From tests made elsewhere it is anticipated that 1½ per cent. solution will be found strong enough for actual use in practice. Farmers might, therefore, treat their wheat this season with a solution of 1½ per cent. bluestone, and afterwards dip it in lime-water. Such treatment should not seriously injure germination, and should prove an efficient destroyer of bunt.

List of Fertilisers in New South Wales.

F. B. GUTHRIE, A. A. RAMSAY, AND J. O. HEINRICH.

1912 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, and their values, is the result of the revision of the list issued in April, 1911.

The list is published in the interest of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

A word is necessary in explanation of the column giving the "values" of the manures. These figures are calculated from the composition of the manures as represented by analysis, a definite unit-value being assigned to each of the fertilising ingredients. The units on which the values here given are computed are as follow :—

UNIT-VALUES of fertilising ingredients in different manures for 1912.

	Per unit. s.	d.
Nitrogen in nitrates ...	19	0
,, in ammonium salts ...	15	3
,, in blood, bones, offal, &c.—fine ...	15	3
Phosphoric acid in bones, offal, &c.—fine ...	2	11
Potash in sulphate of potash ...	5	7
Phosphoric acid in superphosphate and mineral phosphate—		
Water-soluble ...	4	11
Insoluble ...	2	9

PRICE per lb. of fertilising ingredients in different manures for 1911.

	Pence per lb.
Nitrogen in nitrates ...	10·2
,, in ammonium salts ...	8·2
,, in blood, bones, offal, &c.—fine ...	8·2
Phosphoric acid in bones, offal, &c.—fine ...	1·5
Potash in sulphate of potash ...	3·0
Phosphoric acid in superphosphate and mineral phosphate—	
Water-soluble ...	2·6
Insoluble ...	1·5

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result being the value of that substance in the ton of manure. For example, a bone-dust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid:—

4 x 15s. 3d. = £3 1s. 0d. = value of the nitrogen per ton.
20 x 2s. 9d. = £2 15s. 0d. = value of the phosphoric acid per ton.

£5 16s. 0d. = value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail price of the manure, and the fact that in the majority of cases the price asked and the value assigned are fairly close shows that the valuation is a reasonable one.

These figures have been checked in all cases by analyses made on samples collected by an officer of the Department. It by no means follows, however, that the particular product analysed and here published will be in stock for any length of time.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid." In these cases the lower one has been published in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis, in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession; for example, if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed up.

In the case of bone-dust, blood and bone manures, &c., the valuation has been made irrespective of the fineness of division, and is based on the amounts of fertilising ingredients only; but it must be borne in mind that finely ground bone-dust acts more rapidly than coarse, and that unground fragments of bone only become available as fertilisers very slowly.

A word may be added in explanation of the term "water-soluble phosphoric acid." When bones or mineral phosphates are acted on by sulphuric acid, a portion of the tricalcic phosphate is converted into another lime compound, known as monocalcic phosphate or superphosphate. This compound is soluble in water, and it is to its presence that the rapid action of the phosphate is due. This is the "water-soluble" acid of the table. In many superphosphates, however, a considerable portion of this compound has undergone change. This change may be due to the salts of iron and alumina present, or to the length of time it has been kept, and it results in the formation of a third lime compound—bi-calcic phosphate. This is known as "reverted" or "retrograde" phosphoric acid, and is insoluble in water, but soluble in ammonium citrate.

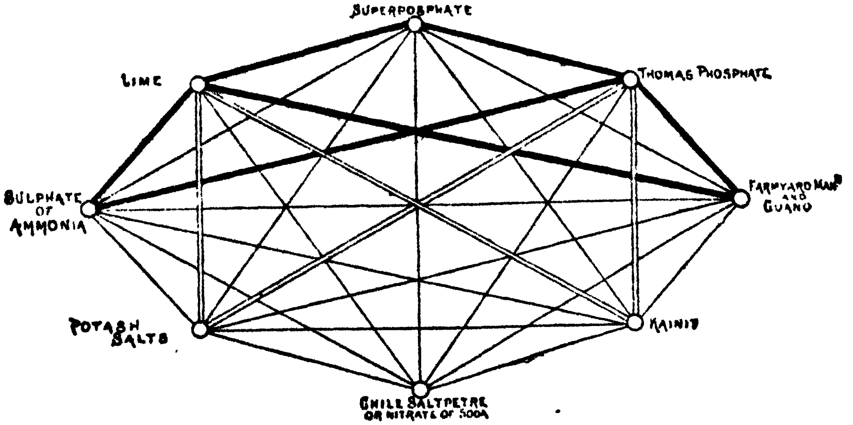
In the fourth table are a number of waste products which may in many cases be economically utilised.

WHEN purchasing a manure always insist on a guarantee of its composition as determined by analysis.

Artificial manures should be mixed with about three times their weight of dry loam, and distributed evenly.

Never add lime to a manure containing sulphate of ammonia or blood and bone manures, as in these cases loss of nitrogen results; and when lime has been applied to the land do not use such manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures. The diagram originates with Dr. Geekens, Alzey, Germany, and is taken from an article by Mr. Leo. Buring in the ***Garden and Field*** of 10th October, 1903.



Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single thin line may be mixed together at any time.

I.—SIMPLE FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.					Manurial Value.
		Nitrogen.	Equivalent to Ammonia.	Lime (CaO).	Potash (K_2O).	Phosphoric Acid (P_2O_5).	£ s. d.
Sulphate of ammonia	George Shirley, Ltd., 279 George-street	20·42	24·80	......	......	......	15 11 9
" "	Australian Gaslight Co., Kent-street	20·40	24·77	......	......	......	15 11 1
" "	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-street.	20·75	25·19	......	......	......	15 16 5
" "	Paton, Burns, & Co., 75 York-street	20·40	24·77	......	......	......	15 11 1
Nitrate of soda	" "	15·8	19 2	......	......	......	15 0 0
Kainit	George Shirley, Ltd., 279 George-street	......	......	......	12·5	......	4 11 8
"	Paton, Burns, & Co., 75 York-street	......	......	......	12·9	......	4 14 7
Sulphate of potash	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-street.	......	......	......	53·25	......	14 17 4
" "	George Shirley, Ltd., 279 George-street	......	......	......	52·0	......	14 10 4
" "	Paton, Burns, & Co., 75 York-street	......	......	......	52·0	......	14 10 4
Bone phosphate	" "	......	......	......	......	29·8	4 7 9
Gypsum fertiliser	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-street.	......	......	98·0 Cryst. $CaSO_4$.	......	......	......

II.—BONE AND BLOOD MANURES.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.		
		Nitrogen.	Equivalent to Ammonia.	Phosphoric Acid.	Equivalent to Tricalcic Phosphate.	£	s.	d.
Special fertiliser, No. 3	Co-operative Wholesale Society, Alexandria	5·0	6·07	18·0	39·29	6	4	9
Bone-dust, B.D.1	Paton, Burns, & Co., 75 York-street	3·7	4·5	22·12	48·22	6	0	11
,, B.D.2	,, ,, ,,	3·7	4·5	22·12	48·22	6	0	11
,, B.D.3	,, ,, ,,	3·3	4·0	20·07	43·75	5	8	10
,, B.D.4	,, ,, ,,	3·3	4·0	18·4	39·71	5	4	10
Bone and blood, B.B.1	,, ,, ,,	5·7	6·5	18·0	39·29	6	19	5
,, ,, B.B.2	,, ,, ,,	5·1	6·0	12·0	26·16	5	12	9
Bone and blood manure	R. S. Lamb & Co., 55 Pitt-street	5·76	7·0	13·74	30 0	6	7	11
A 1 bone-dust...	,, ,, ,,	3·7	4·5	21·98	48·0	6	0	7
⁂ bone-dust	,, ,, ,,	3·91	4·75	22·9	50·0	6	6	5
Vulture manure	,, ,, ,,	3 29	4·0	18·32	40·0	4	13	7
Blood and bone manure	Silvester Bros., Regent-street, Redfern	3·99	4·84	21·98	47·98	6	5	0
Raw or green bone-dust	A. Wooster, Epping	4·01	4 86	24·41	53·3	6	12	4
Blood and bone-dust ...	,, ,,	5·76	7·0	13·74	30·0	6	7	11
Pure steamed bone-dust	,, ,,	3·91	4·75	24·5	53·5	6	1	1
Blood and bone manure	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-street.	5·5	6·67	18 0	39·29	6	17	4
Bone-dust	,, ,, ,, ,,	4·25	5·16	21·85	47·7	6	8	6
,,	I. Tester, O'Riordan road, Alexandria	3·7	4 5	21·98	48 0	6	0	7
White bone-dust	Sydney Soap and Candle Co., Ltd., 365 Kent-street	3·5	4·25	27·00	58·88	5	17	9
Blood and bone manure	,, ,, ,,	5·0	6·07	17·0	37·06	6	5	10
Bone and blood manure	J. Cooke and Co., Sandown, Granville	6·85	8·32	10·44	22·82	7	4	7
,, ,, ,,	Jas. Barnes, Granville South	5·21	6·32	15·74	34·36	6	5	4
Blood ...	B. Richards & Sons, Ltd., Riverstone	13·75	16·0	....	....	10	9	8
Bone-dust	M. Gearin, Gardiner's-road, Botany	3·7	4·5	23·47	51·29	6	4	10

III.—SUPERPHOSPHATES, MIXED FERTILISERS, AND IMPORTED FERTILISERS.

Manure	Where obtainable.	Guaranteed Composition.				Manurial Value.		
		Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	£	s.	d.
Superphosphate No. 1, 36–38 %	George Shirley, Limited, 279 George-street	......	17·0	......	......	4	3	7
,, No. 2	,, ,,	1·6	15·0	33·0	1·	5	13	9
,, No. 3	,, ,,	3·3	13·0	28·0	2·	6	5	5
,, No. 5	,, ,,	3·3	12·0	26·0	7·	7	8	5
,, No. 7	,, ,,	1·6	11·4	25·0	1·	4	6	1
,, No. 9	,, ,,	4·1	6·5	14·0	4·	5	17	0
,, No. 11	,, ,,	......	11·4	25·0	7·	4	15	2
,, No. 12	,, ,,	3·3	5·5	14·7	2·	5	17	9
,, No. 14	,, ,,	2·5	5·5	14·2	6·	6	6	4
,, No. 18	,, ,,	......	5·5	14·2	6·	4	8	2
,, No. 19	,, ,,	4·1	4·1	11·4	2·	5	17	2
Bone phosphate A	,, ,,	·5	......	29·8	......	5	15	0
,, ,, M	,, ,,	1·6	......	16·0	1·	2	14	8
,, ,, N	,, ,,	1·6	......	16·0	4	3	11	5
,, ,, O	,, ,,	2·5	......	13·7	6·	5	15	0
No. 1 Superphosphate	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-st.	......	17·0	......	......	4	3	7
A1 ,,	,, ,, ,,	......	20·5	......	......	5	14	6
Nitro-superphosphate	,, ,, ,,	1·35	15·44	......	......	4	16	5
Bone superphosphate	,, ,, ,,	1·5	9 0	......	......	3	7	1
Marion Guano	,, ,, ,,	......	......	31 0	......	4	10	5
No. 6. Potato Fertiliser	A. Wooster, Epping	4·52*	......	14·19	5·	6	18	3
No. 7. Complete Fertiliser	,, ,,	5·01†	......	14·56	2·	6	9	11
Superphosphate	Paton, Burns, & Co., 75 York street	......	17·0	......	......	4	3	7
Complete Mixed Manures, P.B.1	,, ,,	4·3	4·25	9·75	5·	5	11	10
,, ,, P.B.2	,, ,,	3·75	4·25	9·75	7·1	6	15	2
,, ,, P.B.3	,, ,,	3·4	5·10	9·0	7·1	7	5	0
,, ,, P.B.4	,, ,,	3·3	2·75	9·65	7·1	6	14	1
,, ,, P.B.5	,, ,,	4·3	4·25	9·75	2·4	6	4	5
,, ,, P.B.6	,, ,,	3·3	6·0	12·68	2·4	6	14	5
,, ,, P.B.7	,, ,,	1·7	6·8	13·47	1·2	5	5	6
,, ,, P.B.8	,, ,,	·82	8·5	10·80	7·1	6	8	1
,, ,, P.B.9	,, ,,	2·47	......	9·09	4·9	4	15	6
,, ,, P.B.10	,, ,,	2·47	......	10·5	4·9	4	16	9
,, ,, P.B.11	,, ,,	2·47	......	10·5	2·4	4	0	10
,, ,, P.B.12	,, ,,	1·6	......	14·9	·6	3	11	2
,, ,, P.B.13	,, ,,	......	......	12·0	7·1	3	14	8

* ·75 Ammoniacal. † 1·20 Ammoniacal.

IV.—WASTE-PRODUCTS, ASHES, &C., NOT ON THE MARKET.

Manure.		Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Manurial Value.		
											£	s.	d.
Deposit from wool-scouring tanks.	1	Liverpool Wool-scouring Works.	...	...	·64	·78	...	...	...	·72	0	18	9
	2	,, ,, ,,	...	...	1·02	1·24	...	...	·16	·39	0	18	2
	3	,, ,, ,,	...	...	1·37	1·66	...	...	·14	·20	1	2	5
Deposit from breakers		,, ,, ,,	34·47		1·81	2·20	50·68	·85	·88	1·60	1	18	11
Sediment from wool-scouring works.		Yass	19·57		·59	·71	78·24	·97	...	·20	0	10	1
Scutch		Australian Glue-Gelatin Works, Alexandria.	56·98	...	2·95	3·58	...	4·56	None.	None	2	5	0
,, from limed pelts		Hugh Wright, Auburn	5·32	73·42	1·80	2·18	3·61	9·36	·89	·20	1	11	4
Decomposed hair and lime		Fellmongery	9·70	57·08	6·86	8·33	1·22	26·27	...	...	5	4	7
Tan-yard refuse		Tanneries, St. Mary's	6·43	33·83	2·24	2·72	21·43	26·96	·67	...	1	16	1
Tan refuse		...	7·10	50·90	2·62	3·18	16·03	18·58	·56	·18	2	2	7
Fleshings from tannery		...	·91	75·37	4·43	5·38	5·98	...	1·14	·04	3	11	1
Salt (sweepings from tannery)		...	3·04	...	·70	·85	·38	...	...	...	0	10	6
Wool-waste		...	...	...	8·15	9·89	...	...	...	...	6	4	3
,,		...	34·38	28·20	1·97	2·39	26·03	2·75	·37	·32	1	12	11
Peat		H. Tager, Moss Vale	72·93	16·68	·35	·42	10·39 (ash).	...	...	...	0	5	4
,,		S. Cook, Pyrmont	49·51	34·63	75	·91	...	...	·06	·01	0	11	6
Burnt peat		...	...	...			84·45	...	·25	·33	0	2	7
Filter-press muck		Cane-mills, Broadwater	16·39	26·07	·22	27	34·86	13·20	5·98	·44	1	3	3
Megass		Clarence River cane	22·86	67·32	·63	78	8·61	·30	·01	·05	0	9	11
Megass ash		,, ,,	...	...			87·69	3·07	·16	·51	0	3	8
,,		Richmond River cane	...	...			...	1·11	·21	4·79	1	7	4
Bloodwood ash		...	...				...	8·47	·27	5·25	1	10	1
Ironbark ash		...	...	...		...	...	...	·82	1·53	0	10	11
Blackbutt ash		...	...	...	...	...	...	7·27	·04	2·02	0	11	5
Red-gum ash		...	...	...	...	...	...	...	·38	4·17	1	4	4
Spotted-gum ash		...	...	...			...	...	·10	70	0	4	2
Boxwood ash		...	...	...		...	...	...	·67	1·65	0	11	2
Grass-tree ash		...	·86	1·78	...	...	33·48	24·94	3·07	5·30	1	18	6
Vine-cuttings ash		...	·49	...	...	...	60·64	11·34	1·85	3·76	1	6	4
Red-apple ash		...	...	...	...	...	54·52	13·96	·47	6·00	1	14	10
She-oak ash		...	...	...	...	...	8·57	42·35	8·85	2·19	1	18	0
Hardwood ash		...	·50	1·35	...	...	62·38	13·50	1·76	3·09	1	2	5
Ash of wild melon		Stock Branch	...	...	...	...	...	5·12	4·85	27·08	8	5	4
Wood ashes		...	·30	...	...	...	21·43	41·37	·35	2·80	0	16	8
,,		Wentworth Irrigation Area	...	...	...	...	11·12	50·78	·53	3·21	0	19	7
Ash of kerosene shale		Hartley Vale	1·49	27·98	·70	85	67·59	...	·28	·14	0	12	1

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Manurial Value.
										£ s. d.
Clinker from locomotive boiler	......	......	......	......	......	......	......	......	·25	0 1 5
Residue from furnace	**R. E. Bragg, Marrickville**	1·55	35·63	·54	·61	52·40	·64	·43	·09	0 10 0
Sea-weed ash	......	......	......	......	......	......	9·27	·49	·59	0 4 6
"	......	......	......	......	......	......	6·29	1·27	17·55	5 1 8
"	......	·43	......	......	......	56·26	9·39	·47	2·26	0 14 0
"	Manly	......	......	......	......	43·06	6·52	·91	13·98	4 0 8
"	"	......	......	......	......	·07	·53	·19	34·30	9 12 1
"	Mr. Harvey, Department	3·25	19·46	......	......	61·63	4·22	·33	·22	0 2 2
Sea-weed, fresh state	......	80 00	......	·16	·19	......	·41	·09	1·18	0 9 3
Sea-weed	......	41·03	42 49	·14	·17	......	......	·21	·60	0 6 1
Sea-weed, dried	......	18·58	65·97	1·64	1·99	15·44 (ash).	3·44	·14	·14	1 6 2
Air-slacked lime	......	16·58	......	......	......	1·88	75·44	......	......	......
Residue from calcium carbide	......	41·36	......	......	......	1·08	36·19	......	......	......
Limestone rock	Queanbeyan	1·10	......	......	......	4·70	48·20	1·22	......	0 3 7
Agricultural lime	Portland Cement Co.	18·43	......	......	......	23·80	Hydrate 13·80 Carbonate 43·97	......	......	......
Gypsum	Marulan		(Crystallised $CaSO_4$=92 64)			4·47	......	......	......	......
Cave deposit, shells, &c.	Cowan, Hawkesbury River	2 11	......	·82	1·00	......	35·40	1·59	·88	1 2 1
" "	Macleay River	23·06	16·01	2 43	2·95	26·77	13·88	7 40	......	2 18 8
Deposit (coral, shell, &c.)	Pacific Islands	2 13	13·53	·72	·87	......	44·00	3 53	·39	1 3 6
Shells..	**Pambula River**	......	......	......	......	......	44·59	·10	......	......
Flue deposit	**Maitland**	......	......	......	......	83·75	2·56	·32	·31	0 2 8
"	**Liverpool**	......	......	......	......	91·17	·42	1·29	·17	0 4 9
" **from sanitary furnace**	......		......	......	......	63·53	6·64	1·82	1·61	0 14 3
"	......	6·30	2·45	......	......	84·89	·32	·35	·38	0 3 2
Night-soil mixed with lime	......	44·33		·74	·89	18·60	7·62	·78	......	0 13 7
Night-soil	**Wagga Wagga**	6·70		·03	·04	82·19	·44	·23	·69	0 5 2
"	"	9·14		·28	·34	78·92	1·18	·18	·54	0 7 10
"	"	......		·50	·61	......	......	·64	·62	0 13 0
Night-soil preparation, No. 1	......	8·22		3·73	4·63	50·22	13·32	9·65	·91	4 10 2
" " **No. 2**	......	7 20		1·83	2·22	29·02	8·05	4·10	·15	2 1 8
" " **No. 3**	......	25·95		1·64	1·99	60·17	1·39	1·61	·70	1 13 7
" **preparation, "Pinhoe" manure.**	......	·92	9·54	·21	·25	57·58	14·71	1·26	·56	0 10 0
Night-soil preparation	**F. Artlett, Parramatta**	7·33	30·06	2 10	2·55	46·38	2·09	1·92	·61	2 1 0
" "	"	10·11	42·59	4·97	6·03	·94	30·12	·39	......	3 16 11
" "	**Mr. "Halstead," O'Brien's patent.**	1·54	12·36	·54	65	77·95	......	·63	......	0 10 1
"	......	29·52	56·15	2·55	3·10	14·33 (ash).	......	......	......	1 18 1

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Manurial Value.
										£ s. d.
Farmyard manure	....	67·96	22·09	·40	·49	8·16	·16	·20	·30	0 8 4
Stable manure	Bathurst	39·26	......	·41	·50	....	....	·27	·67	0 10 9
Fowl manure	....	3·95	16·48	1·47	1·78	70·16	2·10	1·94	....	1 8 1
„	....	1·54	15·23	·86	1·04	79·96	·64	·59	·33	0 15 1
Sheep manure	Bathurst	7·73	. .	1·06	1·30	....	....	·69	1·17	1 4 9
„	Liverpool Wool-scouring Works.	9·71	50·91	1·79	2·17	32·26	2·00	·91	·92	1 15 2
Sheep dag	....	....	....	3·04	3·69	....	....	....	....	2 6 4
Refuse manure	Abattoirs	12·00	74·51	4 14	5·03	6·56	....	1·80	....	3 11 11
Flying-fox manure	....	1·09	35·34	3·34	4·05	50·29	1·02	·36	1·15	3 8 5
Fish fertiliser	....	14·47	64·36	10·37	12·59	4·52	....	....	....	7 18 2
Shark fertiliser	....	9·02	68·04	10·59	12 85	3·86	....	7·27	....	9 2 9
Fish manure	....	10 88	59·26	6·10	7·40	5·39	9·82	8·28	....	5 17 2
Rabbit hair, long	Anderson, Oxford-street.	8·73	88·64	14·03	17·04	3 63 (ash).	....	....	....	10 14 0
„ short	„ „	9·72	87 76	14·00	17·00	2·82 (ash).	....	....	....	10 18 6
Bat-guano	....	14 11	17·69	1 55	1·88	28·77	13·72	11·42	....	2 16 11
„	....	10·86	19 65	2·24	2·72	51·95	1·75	3·55	·15	2 5 4
„	....	13 70	34 35	4·76	5·78	3 30	22·28	13·04	trace.	5 10 8
Bat deposit	Cave Flat, Cooradigbee	5 43	12 98	·50	61	57·64	5·60	12·12	....	2 3 0
Guano deposit . .	Tamworth	8 75	38 40	6 17	7 49	12 85		9·24	....	6 1 1
„ „ . . .	„ .	8 42	20 97	3 10	3 76	31 89	. ..	7·87	....	3 10 3
„ „ .. .	„ . .	14 55	29 91	3 66	4 44	15 81		12·98	....	4 13 8
„ „	„ .	9 35	44 32	6 73	8 17	7·33		13·17	....	7 1 0
Bone breccia . ..	Queanbeyan .	5 71		·59	72	9·48	42·80	3·11	....	0 18 4
Muck from waterworks reservoir	Maitland . .	4·84	17 55	74	·90	63·42	4·56	·31	·60	0 15 6
Muck raked from waterhole .	....	63 66	29 86	·81	·98	3·80	·96	·10	·06	0 13 0
Sawdust	....	32·52	62 35	82	1 00	.	. .	1·70	·05	0 17 9
Decayed wood, bark and leaves, bloodwood.	....	57·80		·74	·89	40·68	1·30	....	....	0 11 3
Decayed wood, bark and leaves, pepper-tree.	....	79·92		·89	1·08	17 77	1·50	....	....	0 13 7
Coco-nut oil cake	....	8 24	......	3 29	3·99	....	....	1·20	1·49	3 2 0
Castor cake	....	18·81	74·08	4·30	5·22	....	....	1·83	·86	3 15 9
Pea cake	Java	16·02	......	7·24	8·79	....	....	1·46	1·17	6 0 3
Bean cake	North China . .	14·52	80·32	6·77	8·22	....	....	1·33	1·99	5 18 3
Rice husks	....	42·74	42·15	1·07	1·30	13 77	·02	·03	·04	0 16 8
Field pea, whole plant	....	88·58	9·97	·55	67	....	·15	·12	·49	0 11 6
Tares, whole plant	....	83·97	14·96	·73	·88	....	....	·11	·21	0 12 7
Marsh mallow, whole plant ..	....	79·00	17·86	·85	1·03	....	....	·14	·69	0 17 8
Horse bean, leaves and stalks ..	....	82·87	15·90	·90	1·09	....	·05	·11	·54	0 17 1

Destruction of Prickly Pear.

THE Department of Agriculture of this State is conducting some experiments in the Scone district with various specifics for the destruction of prickly pear. Machines for cutting the pear are also being tried. As the experiments are only just commencing, no results will be available for some months. In the meantime the following circular from the Queensland Board of Advice on Prickly Pear Destruction should be of value to those who have pear-infested lands in this State :—

DESTRUCTION OF PRICKLY PEAR BY MEANS OF ARSENICAL POISON.

Summary of Appendices 1 and 2 to Interim Report of Queensland Board of Advice on Prickly Pear Destruction.

Scattered plants of prickly pear are best destroyed by injecting the poison. This may be done by means of any of the powder or liquid injectors, or by making a longitudinal incision in the second or third "leaf" of the plant, and placing therein either about a teaspoonful of the dry powder (*a*) or a wineglassful of the concentrated solution of the poison (*b*).

With small plants one injection is generally sufficient, but with larger plants two or more "leaves" may have to be treated.

Large clumps of pear, consisting of many plants, and denser pear generally, may be more economically destroyed by first lightly spraying with the diluted spraying solution (*c*), then mutilating or slashing the pear with billhooks, spudbars, or any suitable mechanical contrivance, and then again spraying.

In any case it is advisable to burn off the poisoned pear as soon as it has become dry enough to burn readily, as this operation destroys most of the young growth of seedlings, &c., which is usually found under the clumps, and which is often not destroyed by the poison.

The mixtures are prepared as follows :- -

(*a*) DRY POWDER FOR INJECTION.

Take fifteen (15) lb. of common salt,
Ten (10) lb. of arsenic,
Four (4) lb. of caustic soda,

and mix these ingredients thoroughly. All the ingredients should be in powder. The mixture must be kept in air-tight tins or packages, otherwise it absorbs moisture from the air, and is inclined to set into a hard lump.

(*b*) CONCENTRATED SOLUTION FOR INJECTION.

The mixture of the dry powder (*a*), consisting of 15 lb. of common salt, 10 lb. of arsenic, and 4 lb. of caustic soda, is placed in a suitable vessel, and to it is added slowly and carefully, with constant stirring, cold water until he total volume is eight (8) gallons.

Should it be found that all the arsenic has not dissolved (which is shown by the fact that it appears as a sediment on the bottom of the vessel) it will be necessary to boil the mixture for a few minutes.

Certain brands of arsenic are more readily soluble than others, and we found "Red Rose" arsenic to be the most readily soluble of many tested.

(*c*) DILUTED SOLUTION FOR SPRAYING.

To eight (8) gallons of the concentrate (*b*) add cold water until the total volume of the solution is one hundred (100) gallons.

This strength of solution is the weakest which can be used economically for spraying, and at certain seasons it may be necessary to use the spraying solution somewhat stronger.

The addition of saltpetre, copper sulphate, or other compounds to the spraying liquid cannot be recommended. They are either useless or worse than useless.

On account of the highly poisonous nature of all arsenical compounds, great care must be taken in the preparation of the solutions, and, particularly, the vapours of the boiling solutions and the spray-laden atmosphere (when spraying) should never be inhaled. To prevent possible absorption of the poison through the skin, it is advisable always to rub vaseline or other grease on the hands and arms before commencing operations. There is, however, little danger if reasonable care is exercised.

Cattle must be kept off country on which pear is being poisoned either by spraying or by injection. The grass will generally grow again after a few weeks in favourable seasons, and cattle may then be allowed to graze with safety on the treated area.

J. C. BRÜNNICH,
Chemist to the Department of Agriculture and Stock.

SPRAYING PUMPS.

There are several good makes of pumps on the market, but the Department is not prepared to recommend any particular one. The following notes are taken from an article on "Spraying," by Messrs. Allen and Bryant, which appeared in the *Gazette* for March, 1910, and may be found useful in this connection:—

SPRAY PUMPS AND OUTFITS.

The particular outfit to be selected for spraying purposes will depend altogether upon the amount and character of the work to be done. Numerous pumps are made for the special work of spraying. A pump simple in construction is to be preferred. No one outfit can be expected to suit all the varying conditions of spraying. Hand-pumps should give great pressure with the least expenditure of power. All working parts should be made of brass, and easily taken to pieces. No type of spraying outfit is more widely used, or has given better satisfaction, than the barrel-pump. There are a great many different makes on the market, of which many are efficient and successful. They are mounted in a great many ways. An ordinary fifty-gallon whisky barrel forms an excellent and inexpensive tank for holding the spray. The pump, according to its design, may be inserted in the end or the side of the barrel. The barrel may be mounted, to suit the operator, on a slide, or on two wheels, or it may be placed in a cart.

HOSE AND NOZZLE.

Nothing contributes more to success in spraying operations than good hose and nozzle. Inch hose is generally used. It never pays to use cheap hose in spraying, as it is subjected to a great deal of rough handling. It should be three or four ply.

The couplings should be of a style readily adjusted, and everything must be kept tight to withstand pressure.

NOZZLES.

One of the most important parts of the whole apparatus is the nozzle Good results in the application of the spray mainly depend upon its efficiency. For general use the best nozzle is the Vermorel, or one of that type. The four most commonly used nozzles are as follow :—

The Vermorel.—This undoubtedly throws the finest spray of any. In use it should be held quite near the foliage, as the liquid is not thrown out with much force.

The Bordeaux —This is a splendid type. It has the advantage over all other spray nozzles in that the character of the spray is rapidly changed from a solid stream to a mist-like, fan-shaped spray. If there is any clogging, it is easily remedied by turning the handle, thereby forcing out the obstruction with the pressure of the pump.

The Cyclone.—The spray from this nozzle is conical shaped, similar to the Vermorel.

The Friend.—This nozzle is coming largely into favour.

THE AGITATOR.

All pumps should be fitted with good agitators. The proper agitation or intermingling of the spray liquid is one of the chief features in spraying, and unless it is thoroughly done, good results will not be obtained.

CARE OF THE OUTFIT.

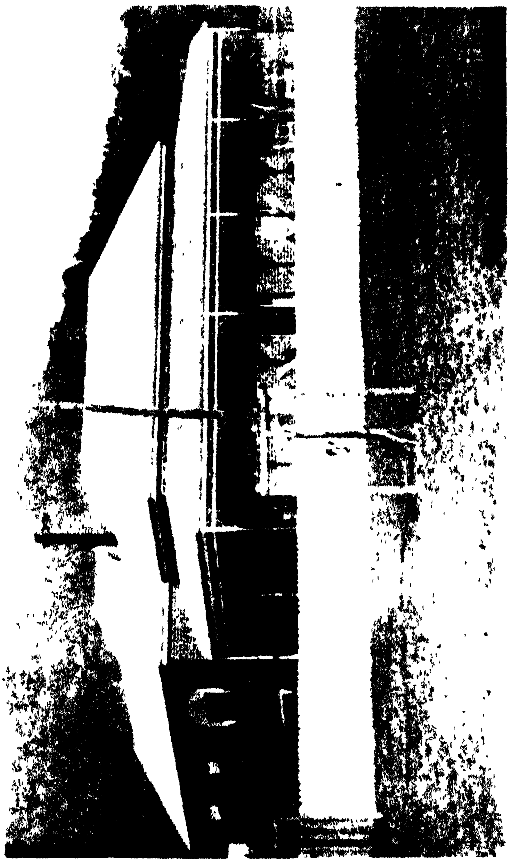
A spray-pump, like any other machine, will do good work, and last in proportion to its care. When a pump does not work properly, the cause of the trouble should be ascertained at once, and remedied, otherwise permanent damage may result. When a spray-pump is first received, its working parts should be carefully studied. After the pump has been used, it should be thoroughly washed out with warm water, as most of the spraying mixtures are highly corrosive in their action. The hose should also be thoroughly washed out. Always keep the barrel filled with water when not in use, to prevent the wood from warping and hoops becoming loosened With proper care the pump should last several years ; the hose, however, will probably have to be replaced after one or two seasons.

TREATMENT OF SEED POTATOES WITH FORMALIN.

A Warning.

IN this *Gazette* on several occasions it has been recommended that seed potatoes be treated with formalin to prevent the development of scab and other diseases in the crop. This last season the potatoes at Bathurst Experiment Farm which were treated in this way were practically a failure, whilst plots of untreated seed germinated well. In the Farmers' Experiment Plots also the germination was defective, probably due to the same cause.

It seems clear that, under some conditions at least, formalin has a very bad effect upon the germination of potatoes. Experiments are now being conducted with solutions of different strengths, and other remedies are also being tested Meanwhile this warning is issued for the benefit of potato-growers, who are advised to be cautious in using formalin



Mr. D. McDonald's residence, Manilla.

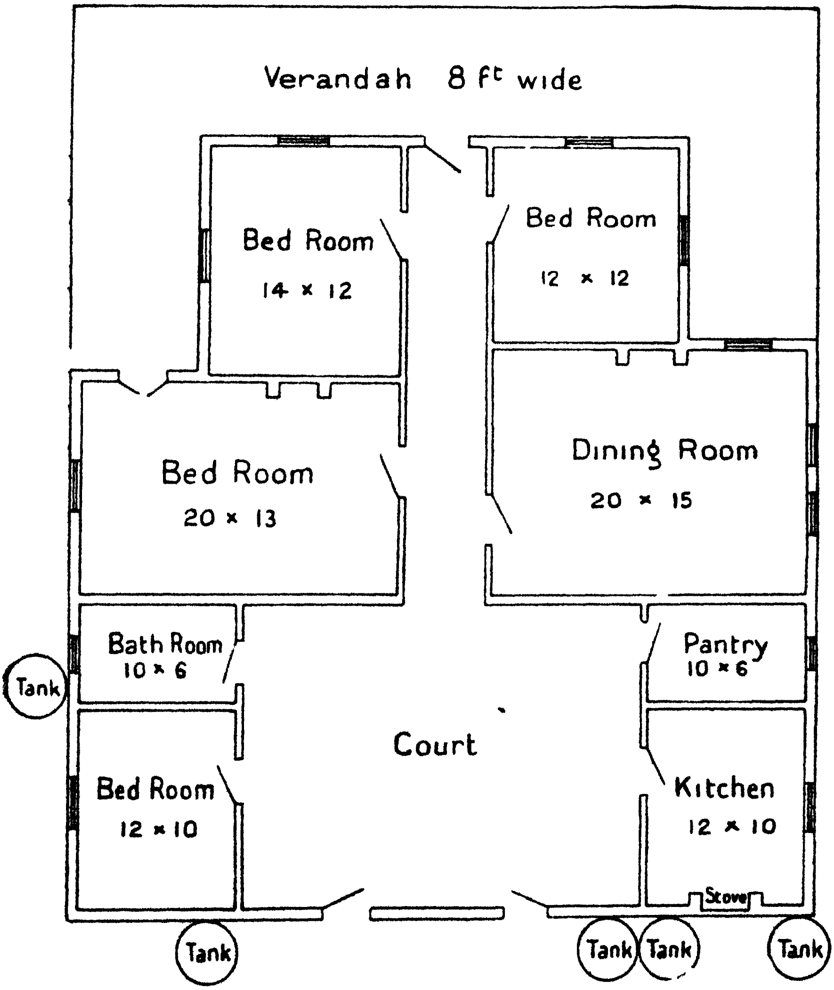
ATTRACTIVE RURAL HOMES.

A crop of irrigated Tobacco on Mr. D. McDonald's farm at Manilla.

Attractive Rural Homes.

7. Mr. D. McDonald, Manilla.

THIS house may be commended for its neat external appearance and ample ventilation The large court at the end of the hall should ensure a cool draught of air in hot weather The home has more the appearance of a suburban villa than of a farmer's residence, as the latter term is too commonly understood Why is it that there is such a sharp contrast between the homes of city men and those of farmers of similar financial status? Jim



Ground Plan of Mr. D. McDonald's Residence, Manilla.

McNeil, successful city clerk, mortgages ten years of his life to provide what he considers a suitable home for his wife and little ones. His brother Jack, wheat and sheep man on the western slopes, and able to buy Jim out several times over, is content with a home in which Jim would be ashamed to live.

Mr. McDonald has also supplied the photograph which we publish of a fine crop of tobacco. It was grown under irrigation, and is the eighth crop in succession from the same land.

The following particulars of Mr. McDonald's farming operations have been supplied by himself. It is the story of the pioneer—a story which will always be appreciated by those whose connection with Australia is not a mere matter of yesterday :—

> On the 21st September, 1871, I managed to have saved £25, and on that date I paid 5s. per acre on 100 acres of land, parish of Diniwarindi, where I have lived ever since. I increased my farm every year till I held 3,140 acres. It took me twenty-five years to get that amount of land. I did not cultivate much land for the first ten years, because I could always earn good wages at contract work fencing. Clearing the land in the early days was a very expensive item, as all the trees were grubbed out by the roots in the green state. The ploughing was all done with a single-furrow plough, and the wheat cut with the hook.
>
> I bought the first binder that came to the Manilla district in 1879, cost £96, delivered at Manilla in two large cases. It was a wire binder. I did very well with it for two or three years. Then the stripper came, and the wire binder was put aside.
>
> I increased the cultivation until I had 1,100 acres under crop, all wheat. The land here is very good for wheat-growing. I used to consider 25 bushels a fair average crop. Sometimes 40 bushels per acre were stripped on this farm.
>
> About ten years ago I applied for a license to pump 60,000 gallons of water per hour out of the Manilla River for irrigation purposes. The license was granted, and I erected a plant capable of pumping 40,000 gallons per hour. The irrigation plant has been a great success. There are 26 acres under irrigation just now, all let to Chinese. They grow principally tobacco. Sometimes they send vegetables by the truck-load to Sydney and Newcastle.
>
> This farm is only 2 miles from Manilla township. The Manilla–Barraba railway runs right through it. There is a siding on it, and it has 2¾ miles of river frontage.

INSECTS ATTACKING LUCERNE SEED.

A CANOWINDRA farmer recently forwarded to the Department of Agriculture a sample of lucerne seed which he had lately threshed, and had carefully bagged in double bags, but which had been attacked by insects like weevils, of which he forwarded specimens.

The sample did not contain weevils, the insects present being known as "millepedes." These do not destroy the seed like the weevils. The Superintendent and Chief Inspector of Agriculture states that both pests can be destroyed by the same method. The seed should be placed in an air-tight room or chamber, and fumigated with carbon bisulphide. This is a heavy gas, and if applied at the top, works its way down through the seed. Cotton waste dipped in the liquid, and sewn in the top of the bags, will get rid of the weevils or millepedes, in the same way.

Combined Churns.

C. PEDERSEN, Dairy Branch.

THERE seems to be some doubt amongst butter-makers as to whether the Combined Churns do as satisfactory work as is claimed for them. One of the great advantages claimed by the manufacturers or agents of the machines is that more moisture can be incorporated in the butter, without being noticed. Since the fixing of a standard for moisture in butter, the main question which confronts the butter maker to-day is, under the various conditions with which we have to contend, to keep the moisture content within the legal standard.

Combined Churns have been in use for about twenty years; still their progress has been rather slow. Owing to increased cost of labour these machines have had a better sale of late years, as they are considered labour-saving; and, undoubtedly, they do much of the heavy work, but they cannot do the thinking. Everything will have to be in order, and temperatures will have to be kept to suit the machines

On the request of the manager of one of the North Coast factories—a factory in which two new Combined Churns have been installed—some experiments were recently carried out, and the results are very satisfactory, considering that the factory at the time could not control temperatures so completely as we should be able to do in a climate like ours.

The experiments were carried out on the 23rd, 24th, and 25th January, with two different makes of churns, which will be known as "A" and "B." The following table gives the results of the experiments:—

EXPERIMENTS WITH COMBINED CHURNS.

No.	Grade.	Date of Churning.	Certificate No.	Water percentage	Churn	Temperature of Cream.	Temperature of Wash-water.
						degrees	degrees.
1	1st	23-1-12	5,645	14·19	A	51	47
2	,,	23-1-12	5,645	13·19	B	52	47
3	,,	24-1-12	5,645	14·81	A	54	48
4	,,	24-1-12	5,645	13·46	B	54	48
5	,,	24-1-12	5,645	14·04	A	60	48
6	2nd	24-1-12	3,073	13·93	B	60	48
7	,,	24-1-12	3,073	16·98	A	61	48
8	1st	25-1-12	5,645	15·07	A	54	50
9	,,	25-1-12	5,645	13·83	B	54	50
10	,,	25-1-12	5,645	14·82	A	50	49

The cream on arrival in the factory was cooled to 48 and sometimes to 50 degrees Fah., but the temperature had gone up somewhat before it was churned.

Butters marked Nos. 1, 2, 8, 9, and 10, were from cream churned on the day of arrival, and had stood in the vat about two hours or more before being run into the churn. All the other butters were made from cream which had stood in the vats overnight.

It will be noticed in three cases, viz., Nos. 5, 6, and 7, that the temperature of the cream was 60 and 61 degrees when run into the churns. When the conditions under which the butters were made are taken into consideration, butter-making by the old system, and on a hot day with the temperature at 70 degrees in the butter-making room, could not have done much better.

All these three butters broke in from ten to twelve minutes, and were, of course, very soft. Rather more cold water than usual was run in, and the churns were revolved once very slowly to allow the cold water to mix. Then the churns were allowed to stand about ten minutes so as to harden the grains. After the wash-water had been run in the churns, they were revolved once, and then let stand to allow the grains to harden.

We could not afford the time to do this with No. 7 butter, as it was getting late in the day, and we had to get finished before dark ; so this butter did not receive the attention that the other two did. But the experiments show that, with care and attention, even cream of such high temperature can be made into a suitable butter from a moisture point of view.

Conclusions.

There seems to be no reason why these churns should not give satisfaction, at least as far as regards the keeping of the moisture content within legal bounds, provided the temperature of both cream and wash-water are kept as low as required, even if the cream be at 54 degrees, but the wash-water should not be over 50 degrees Fah., and the churns should be given the time required.

One disadvantage with these churns, as regards the moisture content of the butter, is that when the churns are set going to work the butter, much of the moisture, after being pressed out from the loose grains, is carried round with the barrels and drops from the top of the barrel on to the grainy butter, thus becoming incorporated with the butter again.

It is necessary, as soon as water commences to flow from the tap, to stop the churn and allow it to drain well before the churn is set revolving ; and it will be to the advantage of the butter if the churn is only revolved once round before it is again stopped. It should be constantly stopped as long as the butter is in a granular stage. This process may take, perhaps, from five to ten minutes longer than the method in use in this factory ; still the butter receives only half the amount of working, or in other words, will be sufficiently worked in half the number of revolutions.

The Practical Value of Cow-testing.

O. C. BALLHAUSEN, Dairy Instructor.

As an indication of the value of testing cows, and another instance of the undeniable proof furnished by the Babcock Tester, when cows' butter-yielding capabilities are questioned, the following interesting results obtained on Mr. J. B. Kelly's farm at Tyagarah are worth recording. They also show how even experienced dairymen are led astray in their estimate of an animal's worth, when depending solely upon the appearances or guess-work.

Mr. Kelly had a number of cross-bred Holstein cows in his herd at Tyagarah, and his dairyman, under the impression that these cows were yielding milk of a very inferior quality from a butter-making point of view, suggested that they should be disposed of. However, to be sure, the owner had these cows and part of the remainder of the herd tested, with the result that not only did they hold their own, but on taking an average of the yields of each section, their yield was 1·15 lb. per cow for the day, against 1·01 lb. for the remainder.

How many dairy farmers neglecting to test must be in a similar position—absolutely in the dark, practically speaking, as to the individual merits of their cows! This is another striking instance of the practical benefits which a herd-testing association would afford.

TEST OF DAIRY COWS AT TYAGARAH.

Holstein Cross.					Other Crosses.				
No.	Breed.	Milk.	Test.	Butter.	No.	Breed.	Milk.	Test.	Butter.
		lb.	per cent	lb.			lb.	per cent	lb.
1	Holstein Cross.	34	4·2	1·59	1	Ayrshire	31	3·3	1·12
2		30	3·6	1·20	2	Shorthorn	29	4·0	1·29
3		26	3·6	1·04	3	Shorthorn - Ayrshire	24¼	3·0	·79
4		16¼	4·0	·71	4	Shorthorn	23	3·6	·92
5		26½	5·4	1·60	5	Shorthorn - Ayrshire	38	3·0	1·24
6		27	4·0	1·20	6	Shorthorn	20½	4·2	·96
7		28¾	3·0	·93	7	Shorthorn - Ayrshire	25¼	3·9	1·09
8		21	4·7	1·10	8	Shorthorn	22	3·6	·88
9		30¼	4·6	1·56	9	Shorthorn	22¼	4·0	·99
10		16½	3·6	·66	10	Shorthorn - Ayrshire	19¾	3·3	·69
11		32¾	4·0	1·45	11	Jersey	29¼	3·8	1·23
12		38	3·2	1·33	12	Shorthorn	20	4·2	·94
13		29¾	4·0	1·32					
14		15½	4·1	·69					
15		22½	3·7	·92					
16		22	4·3	1·05					
17		21½	3·6	·86					
18		31¾	4·0	1·41					
	Total ...	470	...	20·62		Total	304¼	...	12·14
	Average ...	26·11	...	1·15		Average	25·35	..	1·01

SURPLUS MOISTURE IN DANISH BUTTER.

SINCE England fixed the standard of 16 per cent. of moisture as the maximum, some trouble has been caused not only in Australia, but in other countries, and particularly in Denmark. In a Danish paper just to hand, three cases are mentioned during the month of January last, as having contained excess moisture.

The difference in dealing with the offenders in Denmark and here is marked, and it is just as well for some of our factories that they are situated in Australia and not in Denmark, for not only were the three factories fined, but, as the paper puts it, the "illegal" butters were confiscated for having been packed in kiels bearing the Lurbrand. The "Lurbrand" is a national brand protected by patent, and every Danish butter package is fire-branded with the Lurbrand. All butters packed in kiels bearing the Lurbrand must be within the standard as laid down by law.

The law governing the Danish dairying industry is vested in the Minister of Agriculture, and to show the power a Minister has, it will be necessary only to quote Regulation 10 under the Act:—

> In case a factory trade contrary to the Act or to the regulations laid down by the Act, the Minister has the power to prevent any offending factory from making use of the Lurbrand, and can, through the police, take possession of the balance of articles in the factory bearing the Lurbrand.

Very few butters have come forward with excess of moisture, and the strictures will no doubt make the factories careful. Considering these butters were made during one of the coldest months, the defects could not be due to want of cooling power, which may in many instances be the case with us, and must be put down to carelessness. That may be how the Minister looked at the cases, and may explain the extreme penalty.—C. PEDERSEN, Dairy Instructor.

WHITE ANTS AND FRUIT TREES.

INQUIRIES are being received upon this subject from time to time, although it has been dealt with in the *Gazette* on several occasions. Mr. W. W. Froggatt, Government Entomologist, recommends that the soil be well opened out round the trunk and main roots, and any damaged wood or dead roots carefully cut away, and any scars painted with tar or paint. German potash (Kainit), if mixed with the soil round the roots and trunk, three or four pounds to a large tree, will drive the white ants away, and also act as a manure for the tree treated. All dead wood, stumps and stakes should be cleared out of infested ground, and any nests that can be found should be burnt out.

Factory Records from Dairy Herds.

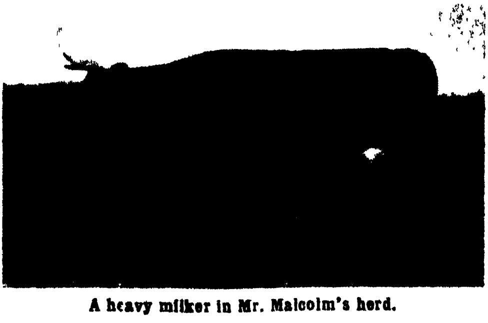
P. G. HAMPSHIRE, Dairy Instructor.

Mr. R. Malcolm, of Dumaresq Island, Manning River, is an example of what can be done by judicious breeding and culling of dairy herds. Mr. Malcolm has been breeding for sixteen years, and has always taken a keen interest in the selection and mating of his stock. His herd consists of pure and grade milking Durhams, and he has some very fine animals among his herd, as shown by the illustrations. Mr. Malcolm practically obtained all the prizes in milking Durhams at the last Manning River Show.

Mr. R. Malcolm's bull Dumaresq, by Banker II from Melba II.

The returns from this herd for November last from 44 cows milked were £55, although 12 of the herd were heifers, and a number had been in a long time. Mr. Malcolm has always used sires bred on sound milking lines. The bull Dumaresq, which he is using at present, is a very fine type of animal, closely related to the winner in this class for the last two years at the Royal Sydney Show, and is by Banker II from Melba II. This bull's progeny promise well.

Mr. Malcolm has milking machines, and with a boy is able to milk thirty cows per hour.



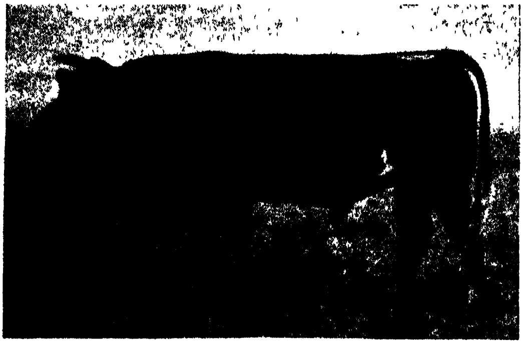
A heavy milker in Mr. Malcolm's herd.

The gas-engine which drives the machines (three single) also works the separator, and costs on an average 5s. 3d. per week for fuel.

This dairyman's farm consists of 65 acres of rich alluvial land, mostly well grassed with paspalum, couch and clover, but 6 acres are under lucerne. Mr. Malcolm has also 70 acres of forest country for young and dry stock.

A well-bred Durham in Mr. R. Malcolm's herd. A good milker and frequent prize-winner.

Mr. R. W. Hayward, of Jones' Island, Manning River, is another farmer who is now reaping the fruits of careful breeding and frequent culling of his herd. Mr. Hayward's returns for three months are:—October, 35 cows milked produced 1,096 lb. butter, equal to £52 10s. 4d.; November, 40 cows, 1,148 lb. butter, equal to £55 0s. 2d.; December, 40 cows, 1,233 lb. butter, equal to £60 7s. 4d. This is a splendid return, and for three months averages nearly 30s. per cow per month. Mr. Hayward has been dairying for about twelve years, using pure-bred Durham, Jersey, and Ayrshire sires of good strains. This herd is a very even lot, which show more to advantage with the bucket than in the paddock; they are milkers, not show cattle.



Messrs. Whatson and Drury's bull Pandora, by Dora's Boy from Pansy IV; purchased from the Department of Agriculture.

Mr. Hayward has milking machines, and with a boy is able to get through a herd of forty in two hours, using two single machines. This herd depastures off 68 acres of rich alluvial land, grassed with luxuriant couch and clover.

Mr. Jonas Drury, of Ghinni, Manning River, has received returns from his herd which would be exceedingly hard to beat. This gentleman is a very keen breeder and judge of a dairy cow. He buys only the best, and culls out any cow not reaching standard. The returns from Mr. Drury's herd are as follows:—October, 24 cows milked, £38 3s. 10d.; November, 25 cows, £40; December, 27 cows, £47 4s. 11d.; January, 33 cows, £56 10s. This is equal to an average of 31s. 6d. per cow per month for four months consecutively, an excellent record.

Mr. Drury has been breeding for about fourteen years, using only well-bred Ayrshire and Durham bulls bred on sound milking lines. The bull which this dairyman has been using for the last three years is the fine type of milking Durham, Pandora, by Dora's Boy from Pansy IV, purchased by Messrs. Drury and Whatson from the Department of Agriculture. This bull is getting fine heifers, and those in are milking well.

Mr. Drury has 80 acres of rich alluvial land, well grassed with couch and clover. He believes in plenty of grass for cows, and does not over-stock.

TRIALS OF AMERICAN VARIETIES OF CEREALS.

A NUMBER of varieties of American wheats and other cereals were tried in 1910 at our Experiment Farms. The wheats came from the Department of Agriculture, Victoria, and included the best of the collection which Senator J. H. McColl brought from America, after attending the Dry Farming Congress there. The other seeds were also from Senator McColl's collections, presented by Mr. J. S. Brunton.

The wheats Fretes, Canadian No. 1 Hard, Defiance Spring, Saumur de Mars (or V.A.C.), Galgalos and Egyptian, proved to have no value over existing varieties here. Three others, however, were found worth sowing again last year. *Turkey Red* has done very well at Glen Innes Farm, the grain being of excellent milling quality, but it is very late, has a weak straw, and the yield is low. *Chul* is the most promising of all these wheats, and is likely to be useful for crossing; the bearded nature of its ears is an objection. It seems very hardy, and quite as prolific as Comeback. Flour-strength, 51. *Propo* seems rather prolific and hardy, but is a bearded variety, with a flour-strength of only 46.

The barleys were tried at Wagga Experiment Farm. Most of them proved to be varieties which have already been tried there, and rejected as unsuitable. "Brewing No. 1," seems to be a mixture of Chevalier, Golden Grain, and Goldthorpe. "Brewing No. 2," a very late, bearded, 6-rowed barley, appears to be very good. Other varieties proved to be identical with the Skinless Barley now grown on the Farm, which was received from the United States nine years ago as "Silver Hulless."

Samples of Japanese Millet, Australian Corn (from Colorado), White Dent Corn, and Russian Millet, were sent to Grafton Experiment Farm. The corns failed to germinate. The Russian millet only grew 12 inches high, and did not appear to be likely to be of any great value. The Japanese millet was also a partial failure.

The Tamworth Pig.

H. W. POTTS,
Principal, Hawkesbury Agricultural College.

THE history of the wild hog, in which its habits, strength, courage, and hardiness are discussed, is a subject of impressive interest to the pig-breeder of to-day, seeing that its constitution, vigour, fecundity, quality of meat and other characteristics are faithfully transmitted. Mr. D. Lowe, in his "Domesticated Animals of the British Islands," states:—

> The facts of the animal's natural and physiological condition show the vast change which domestication produces on his character, and not more remarkable is the difference in the conditions of liberty and subjection in the case of this animal than the readiness with which he yields up his natural instincts and resigns himself to bondage. If the wild pigs be taken young from their mother in the forest they become nearly as docile as the domesticated races, and in a single generation all the fierceness which distinguished the parents is lost. Their very form becomes changed, and those characters which fit them for a state of liberty disappear as if in obedience to some natural law.

Taming the Wild Pig.

Amongst the modern breeds of pigs, none exhibit such distinct evidences of their wild origin as the Tamworth. It takes its name from the ancient town of Tamworth, on the borders of Staffordshire and Warwickshire (England), in the neighbourhood of which this undoubtedly indigenous breed of pig has been preserved from the time that the surrounding forest lands were enclosed and occupied. The breed is held to be the direct descendant of the wild hog of the Midland Counties—an ancient and pure race, distinct from any other known breed.

In arriving at this conclusion, it has to be remembered that when first reclaimed from its wild state, and even within the memory of living man, after domestication, this pig exhibited thriftless and unattractive features. Ungainly in appearance, long in the leg and snout, flat and light in the rib, coarse in hair and skin, and late in maturing—these were natural characteristics which failed to appeal to the pig-breeder. But it was noted that it possessed a keen sense of hunger; quick senses of smell and sight; that it was hardy, vigorous, and muscular; the depth through the heart pointed to a strong and healthy constitution, and power to resist disease; the sows were prolific; and both sexes provided a relishable, lean class of flesh, suitable for bacon.

The Place of the Tamworth.

The demand for lean bacon has steadily increased of late years, and the studmaster has not failed to realise in the Tamworth a keen rival to the Large Yorkshire for bacon production. A delicately flavoured bacon, with an attractive intermixture of fat, and with a preponderance of lean, is now sought for by butchers. The breeder satisfies the demand with the Tamworth, by crossing him with other smaller and more compact breeds.

As far back as 1847, Tamworths were exhibited at Agricultural Societies' Shows in England, including the Royal. For a time they dropped out of favour. About 1877, the public taste began to demand lean bacon; and the breeders, with keen judgment, careful selection, and intelligent management, steadily improved the Tamworth to supply that demand. In 1897, the Royal Agricultural Society of England set apart separate classes for them at the annual shows; similar provision was made at other shows, and at Smithfield. The National Pig-breeders' Association admitted the breed into their stud-book and formulated a scale of points.

Improvement of the Breed.

As a result, substantial improvement has been noted year by year; so much so that it is difficult to reconcile the type as bred twenty years ago with that which finds such complete favour with the bacon-curers to-day. There is a vast change for the better in the skin and hair; much of the coarseness so noted in the past has disappeared; the coat is golden-tinted red; the skin devoid of blacks spots and fine in texture; the snout is not so lengthy nor bony, and the legs are shorter; the bone is much finer, and the offal less.

The shortening of the nose has not interfered with the animal's remarkable sense of smell, by which it is enabled to forage so well under adverse conditions. The side is deeper, and the body more compact. There is greater width across the loins, and the hams are well fleshed and thickened down to the hocks.

The flesh is whiter and more delicate and relishable. The aptitude to lay on flesh has increased, and they mature more quickly.

The Tamworth in Australia.

The Tamworths were introduced to Australia by Mr. Geo. Chirnside, of Werribee, Victoria, and the Department of Agriculture of New South Wales at the Hawkesbury Agricultural College. From the latter stud piggery over 200 pedigreed boars and sows have been distributed during the past ten years. The demand for this class of pig is steadily increasing, and this points to their success as a bacon pig.

In the matter of acclimatisation, let it be understood that the term embraces the animal's power to accommodate itself to any change in external conditions of life, whether favourable or unfavourable, gradual or sudden. The Tamworth has been sufficiently long in Australia to prove that our conditions are most congenial to the breed. In fact, it may be safely asserted that it has shown marked evidence of improvement.

When we consider that some of the finest breeds of the world, which have been used to improve European wild races, were taken from the warmer countries of the East, it is not surprising to note the change for the better in breeds brought to Australia.

Here, in the midst of great open spaces, the Tamworth has the opportunity of developing its indigenous predatory instincts. They always were successful foragers, and in this regard they fully maintain their reputation. They thrive under rough grazing and out-door phases of colonial life. Owing to the possession of an easy, active carriage, muscular development, and hardy nature, they are more suited to travel distances to market than the fatter composite breeds, and avoid losing condition. It is also noted that whilst their natural instincts favour grazing and life in the open, they respond well and profitably to forced feeding in sties.

Characteristics of the Tamworth.

The Tamworth more nearly approaches the Large White Yorkshire, in so far that it is not a general-purpose pig; and whilst it is coarser and heavier in offal, and matures more slowly, a compensating feature is the higher quality of flesh for a refined and tasty class of bacon. Those who are responsible assert that there is less waste in cooking, and the fat of the Tamworth has a choice and delicate flavour especially commended by connoisseurs.

The boar is always tractable, intelligent, and easily controlled.

The Tamworth sow is amongst the most easily managed and handled of all pigs at the time of farrowing. There are no difficulties to meet during parturition, a minimum of constitutional disturbances, and no ill after-effects, such as milk fever. The litters range in number from 8 to 14, and will average 10. She is an ideal mother, rarely if ever overlies her young, and is always solicitous, careful and tender in looking after her progeny, and most resolute in their defence. The supply of milk is ample. Naturally it is often a matter of individuality, but our experience goes to prove that as a breed the Tamworths are good, reliable sucklers. They have a powerful digestion, are always ready for food, and have a marked aptitude for milk-production.

The young pigs exhibit a strong tendency to grow, and are thrifty, lively, and always hungry.

Tamworths will not tolerate a check in growth. Unlike pigs that store fat, they have no reserves, and herein it must be observed that continuous increase in weight must be maintained by a permanent food supply.

In our warm, sunny climate, white pigs are liable in the summer months to be affected or scalded by long exposure to sunlight. The Tamworth does not suffer from this disadvantage, and hence he is becoming more sought after in the production of bacon, particularly when crossed with other breeds.

Cross-breeding for Bacon.

In crossing, the Tamworth may be wisely selected to put on Berkshire, Middle York, or Poland China sows, or any compact small sow with a tendency to produce a fat-laden flesh.

The most satisfactory results have been secured all over Australia by crossing the Tamworth with the Berkshire sow. The resulting progeny mature quickly, and grow into an ideal bacon pig of about 130 lb. to 150 lb. live weight in six months. A similar result may be confidently secured from the Poland China and Middle York Crosses.

It is becoming recognised that bacon pigs are quite as profitable as porkers, and, in fact, their value may be partly estimated as on the increase. It is no stretch of the imagination to predict a successful export trade in bacon pigs to Europe at no distant date.

Tests of the Breed.

An impression has been created, and doubtless still exists, that the Large Yorkshire and Tamworth pigs mature slowly, and in consequence fail to give satisfactory returns. This doubt has been completely dispelled by a long series of tests conducted in Canada and the United States. They confirm the experience of those who have bred bacon pigs in Australia. In relation to the tests conducted in the United States, the evidence is summarised in Bulletin No. 47, issued by the Department of Agriculture, Bureau of Animal Industry, and written by Mr. Geo. M. Rommel. He states:—

> These experiments, taken in connection with the evidence of investigators over the entire country, undoubtedly show that representative pigs of the different breeds do not differ materially either in the rate of gain or the economy with which the gains are made. Any marked differences in the breeds will be manifested in the suitability of the fattened animals for market, and the quality of the carcase on the block. A very notable feature is the showing of the bacon breeds when compared with the lard breeds. *The fact that a pig is a Yorkshire or a Tamworth cannot be taken as primâ facie evidence that it will make slow and expensive gains.*

Scale of Points for Tamworth Pigs.

	Maximum Points.
Colour.—Golden red hair on a flesh-coloured skin, free from black	5
Head.—Fairly long, snout moderately long, and quite straight, face slightly dished, wide between the ears	4
Ears.—Rather wide, with fine fringe, carried rigid, but inclined slightly forward	3
Jowl.—Small and light	2
Neck.—Fairly long and muscular, especially in boar	3
Chest.—Wide and deep	5
Shoulders.—Fine, slanting, and well set	4
Girth.—Around the heart	4
Sides.—Long and deep	8
Ribs.—Well sprung and extending well up to flank	6
Loin.—Wide and strong	4
Belly.—Full and thick, with straight underline, and at least 12 teats ...	3
Flank.—Full and well let down	4
Quarters.—Long, wide, and straight from hip to tail	7
Hams.—Broad, full, and well let down to hocks	8
Tail.—Set on high, and well tasselled, not coarse...	3
Legs.—Strong, straight, shapely, with flinty flat bone, set well outside body	6
Ankles.—Strong and compact	4
Pasterns.—Short, and yet springy	2
Feet.—Firm and strong, not splayed	3
Skin.—Smooth, pliant, and free from wrinkles	2
Hair.—Abundant, long, straight, and silky	3
Action.—Free and clean	3
Symmetry.—General style, indicating breeding and good constitution	4
Total	100

Objections.

Head.—Narrow forehead or upturned nose.

Ears.—Thick and coarse, or inclined forward.

Jowl.—Thick and coarse.

Shoulders.—Coarse, heavy, or wide and open at the top.

Ribs.—Flat or short curved ; light back ribs

Loin.—Narrow or weak.

Belly.—Flaccid, or wanting in muscle, gutty or podgy.

Disqualifications.

Colour.—Black hairs or black patches on the skin.

Boars.—Rupture ; one testicle only down.

Sows.—Deficiency in, or very irregularly placed, or blind teats ; injured or diseased udders.

RECENT FARMERS' BULLETINS.

THESE Farmers' Bulletins are small text-books dealing with subjects of interest to farmers. Many are compilations from the *Agricultural Gazette*; others are written specially. Any farmer can obtain copies of them post free by writing to the Under Secretary, Department of Agriculture, Sydney.

The following are some of the ones more recently issued :—

43. Book-keeping for Farmers; by P. G. Gilder, English Master, Hawkesbury Agricultural College.

This is already in its third edition, though first issued in March, 1911.

45. Harness: Harness Fitting and Repairing; by A. H. E. McDonald, late Instructor in Agriculture, Hawkesbury Agricultural College; now Inspector of Agriculture in the North-west.

This has been found valuable, the repairing section being particularly useful to small farmers.

46. Blacksmithing and Horse-shoeing ; by A. H. E. McDonald and T. G. Palgrave, M.R.C.V.S., Government Veterinary Surgeon.

Another useful pamphlet for the small farmer and pioneer.

47. Curing the Lemon; by W. J. Allen, Fruit Expert.

Describes the methods of handling this fruit in other parts of the world as well as in this State.

49. The Housing and Yarding of Laying Hens ; by D. S. Thompson, Poultry Expert, Hawkesbury Agricultural College.

Shows the principles which have been adopted in the Egg-laying Competitions at the College, where records have been made and broken; also gives plans of a cheap and simple house.

50. Black Oats. Compiled from articles by Messrs. A. H. E. McDonald, G. L. Sutton, and M. H. Reynolds, Field Officers of this Department.

One of the most serious problems facing the wheat-grower to-day. The Bulletin gives the best advice of the Department.

51. Poultry-farming; by George Bradshaw.

Shows the prospects and principles of the business. Written as a text-book for beginners in poultry-farming.

52. Fruit-drying; by W. J. Allen.

Deals with a neglected branch of the fruit industry, and one which should enable the grower to get over the difficulty of glutted markets.

The Department has other Bulletins and pamphlets on a variety of agricultural and stock matters. Most of them are free to farmers.

The Pastures of the Hawkesbury-Nepean District.

W. M. CARNE,
Botanical Laboratory, Hawkesbury Agricultural College.

THE object of this article is to indicate the present condition of the pastures of this district, and to suggest means by which they might be improved. Little has been done in this direction, beyond trials of various grasses, legumes, &c., in this district. Without conclusive experiments, definite advice as to the best practice to be followed cannot be given.

This, almost the oldest farming district in Australia, provides considerable interest in regard to its pastures. Its importance to the city of Sydney must, from its position, be always on the increase. The growing demand for fresh milk and dairy products generally must be accompanied by an increasing recognition of the part that the pastures play, and the value to be gained from their improvement. Here, also, we are able to trace what changes have been brought about in the grass flora after over 100 years of settlement. With our knowledge of the soil and climatic conditions, and of the alterations that the past has produced, we are in a position to see what progress we have made, and to lay down lines for work in the future.

These notes apply to the whole district, but because of the data there available, they are largely based upon observations made at Hawkesbury Agricultural College, Richmond.

Climatic Conditions.

Although situated on the coastal side of the Dividing Range, and possessing a rainfall of 31·47 inches annually, the climate must, from the point of view of plants, owing to the frequency of dry summers, be regarded as dry. Under 20 inches are received during the months October to April, during which all our native grasses make their growth. The soil, particularly away from the river flats, is very deficient in humus and consequently in water-holding capacity. Regular monthly rains must fall during the summer months to maintain growth. The average rainfall is well distributed, but unfortunately the monthly fluctuations from year to year are very great. That for January, our hottest month, may vary between less than 1 and over 12 inches. In all the growing months the atmosphere is very drying, as indicated by the evaporation from a water surface, so much so that without good rains between December and March there is no green grass after November. In general, the good years are those with rainfall exceeding the annual average. Very few grasses keep green during the winter, the new Toowoomba Canary Grass being a conspicuous exception.

Practically for five months in the year it is too cold for native grasses, and for several months for most of the introduced grasses, to grow. For four months it is too hot and dry for the majority of the introduced, and also for the native grasses without the summer rains. These periods of adversity affect the European grasses so much that they quickly die out. Clovers grow in the late winter and spring, and into the summer if it be a wet one.

Observations taken at Hawkesbury College.

Extremes of temperature, 18 degrees to 113 degrees F.

Earliest frost recorded, 15th April.

Latest frost recorded, 1st November.

Extremes of monthly rainfall, ·05 to 16·3 inches.

Mean annual rainfall for twenty-five years, 31·47 inches.

Mean annual evaporation from a water surface for thirteen years, 47 inches.

Month.	Mean Rainfall.	Mean Evaporation.
	inches.	inches.
January	3·42	6·4
February	2·65	4·9
March	3·78	4·4
April	2·55	3·1
May	2·72	2·2
June	2·61	1·9
July	2·33	1·8
August	1·89	2·2
September	2·10	3·3
October	2·20	4·6
November	2·33	5·5
December	2·89	6·7

The Soils.

The soils of the district vary from almost pure sand to stiff clays. Geologically they belong either to the Wianamatta Shales or to the Hawkesbury Sandstones, or are recent alluvial. For detailed information as to their chemical nature reference should be made to "Notes on the Soils of County Cumberland," by Mr. F. B. Guthrie.* It will be sufficient to quote the following:—

> They (the soils) are, for the most part, deficient in humus, and their capacity for water is low, the soils from the sandstone formation being somewhat better off in this respect than the shale soils. The possession of this property is important in enabling the crop to resist the effects of drought, and it depends chiefly upon the texture of the soil and its content of humus. . . . The quantities of plant-food in our Cumberland soils are remarkably low, the most striking and serious being the want of lime.

Our pastures are noted for their lack of fattening and milking qualities. A good stand of grass with us has not the value of a poorer stand upon better soils elsewhere.

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* *Agricultural Gazette*, Vol. IX, 1898, page 481.

The Relation of Soil to Pasture Value.

The reason of the poorness of our pastures, as shown by their feeding qualities, is probably to be found in the poorness of the soils in which they are growing. There has been a tendency in the past to attach too much importance to the food value of grasses as shown by analysis. Evidence is accumulating to show that the real food value is variable; that it has more relation to the soil and climatic conditions than to the particular species to which a grass may belong. Where grasses do have different value is in palatability, hardiness, duration, period of growth, bulk of herbage produced, &c. Given two similar areas under similar conditions, the feeding values of the pastures, excluding inedible and objectionable plants, will differ according to the proportion of legumes present only, no matter how otherwise they may differ botanically. And to a large extent the amount of clover is determined by the soil. Experiments in England show that "the herbage of the best grazing land may be twice as rich in nitrogen and phosphates as that of a poor pasture, and this large difference appears to be directly determined chiefly by the proportion of white clover present and indirectly by the percentage of available phosphates in the soil. On soils suited for permanent pasture, inferiority of herbage is generally due either to a deficiency of available phosphates or to their bad mechanical conditions."*

If we admit this, it seems clear that the greatest advance in the improvement of our pastures must be by the improvement of the mechanical and chemical condition of the soils. Drainage, cultivation, liming, and the use of phosphatic manures seem to be the weapons to our hands. The use of lime would encourage the growth of legumes, which even now come up fairly freely on the better soils during the late winter and spring.

It is interesting to note English experience of manuring with phosphates. "Basic slag, applied as a single dressing at the rate of half a ton per acre, has generally proved a most effective agent in improving the feeding value of pasture, and its effects are not nearly exhausted at the end of nine years."† The action of nitrogenous manures tends to increase the proportion of grass to legumes. On the basis of the mutton produced, the above experiments indicate that their use is not profitable. A photograph of Rhodes Grass growing on very poor soil at the College, fertilised with abattoir manure, will appear in next number of the *Gazette*.

Of course, the response of pastures to manures is almost entirely controlled by weather conditions. Experiments at the College and upon the Farmers' Experiment Plots have sometimes failed to show results owing to the lack of the moisture that would enable the plants to use the manure. Superphosphate has been principally used, though the English experiments previously quoted indicate the superiority of basic slag.

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* S. F. Armstrong, *Journal of Agricultural Science*, December, 1907.

† W. Somerville, *Journal of Board of Agriculture* Supplement.—"The Influence on the Production of Mutton of Manures applied to Pastures."

The Pastures.

Clearing, grazing, cultivation, and the introduction of grasses, legumes, weeds, &c., from other parts of Australia and from abroad have brought about considerable changes in the pasture flora since the early days of settlement. And yet to-day it is still to the native grasses that we look for the bulk of our pasturage. Whatever their deficiencies are, we have few other plants able to survive the adverse conditions which come inevitably from time to time.

As found to-day, the pastures fall naturally into four groups:—

1. *Timbered Areas.*—This type is found mainly upon the higher-lying, poor soils. Where the timber is heavy and stock have not been pastured, the pasture is probably as it was before settlement. On the poor sandy and pipeclay soils, the little grass to be found is principally the wiry, three-awned Spear Grass. On better and more open soils the stand is stronger, and Love, Blue, Wallaby, Kangaroo, Plume, and Panick grasses may be found, as well as the ubiquitous Spear Grass. Around water-holes and creeks, the Bamboo Grass forms tall harsh clumps; whilst in the shaded, moist places the Meadow Rice predominates. These have all the dry, wiry, tussocky habit so characteristic of Australian grasses.

Where stock have been pastured, Couch quickly appears and establishes itself about the roads and tracks, spreading by runners and by seed dropped in manure, until in the open places it may form an important part of the herbage. It, of course, spreads faster in the loose sandy soils than in the stiffer ones formed from the Wianamatta Shales.

2. *Areas Cleared but not Cultivated.*—The effect of clearing such an area as the above is to produce a stronger and denser growth of the native forms, with an increasing proportion of Couch. As is usual with Australian grasses, these are all summer growing. From late autumn until late spring, little or no growth is made by them. Earliest in the spring are the Plume and Kangaroo Grasses. Weed plants are plentiful, consisting of shrubby native perennials, Yellow Rush Lily, Buttercups, Lobelias and other plants of doubtful reputation, as well as Blady Grass, sedges and rushes, particularly in badly drained places.

Stocking has the effect of killing out the taller grasses, which must produce long erect stems before seeding. Such are the Tall Blue, Kangaroo, Wallaby, and Plume grasses. The tussocky forms slowly give way to the creeping Couch and to those with underground stems, such as the Meadow Rice and the Small-leaved Paspalum. The tussocky grasses do not appear to be able to stand the same amount of feeding down and trampling. The Love and smaller Blue Grasses, being able to flower close to the ground, manage to hold well for some time, but eventually give way to Couch. Annual weed grasses, such as Rat-tail and Shivery, as well as perennial forms like Spear and Parramatta, being avoided by stock, become more common.

3. *Paddocks Lying Fallow.*—The pastures in these paddocks consist almost entirely of Couch, a few herbs not grasses, particularly clover and trefoil in the spring, and weeds. Couch follows the plough everywhere, and where the conditions are not particularly unfavourable, takes complete possession to the almost absolute exclusion of other plants, except such as are able to grow in the cooler parts of the year when the Couch is dormant.

Couch Grass is undoubtedly our best pasture plant, though it is anything but ideal. Though hardy and persistent to such an extent as to make it our worst weed of cultivation, it is very susceptible to both winter frost and summer drought. It yields short, sweet herbage in the spring and early summer. In the late summer it is frequently burnt up by the heat, but rapidly recovers after rain. During the winter, green herbage is practically confined to annual herbs, small annual grasses, and as the spring approaches, especially in good seasons, trefoil, clover, and a little Prairie Grass.

Prairie is our best winter grass, but it, too, has many drawbacks. It rarely lives more than one year, and does not stand heavy feeding or trampling. Where it is protected from stock it makes splendid growth, as in tree enclosures or in lucerne fields. In the paddocks it has no chance to seed, but this could be obviated by sowing it in small paddocks which could be spelled to allow of natural reproduction. Given an opportunity it yields seed freely.

So, combined with a deficiency in their feeding qualities, even with a good stand of grass, the pastures have the additional faults of lacking green herbage in the winter and early spring, plants other than grasses in the summer, and, where Couch is in possession, variety.

Near water, grasses are found which are valuable for the succulent bite they provide when the rest of the pastures have been burnt up by the summer drought. Amongst them are the Mat, Bent, Ditch Millet, and Barnyard grasses, but the best are two delicate, creeping plants, both called Water Couch.

4. *Artificial Pastures.*—In general, sown and planted pastures have throughout the district proved distinct failures. Rye, Cocksfoot, Kentucky Blue, and many other grasses and clovers, and Sheep's Burnet have been sown, to disappear in a few years. In lucerne we have a splendid exception, particularly on the deep soils of the Hawkesbury flats; in *Paspalum dilatatum*, a qualified success; and in Rhodes Grass, and possibly in Toowoomba Canary Grass, great promise for the future.

Paspalum has been planted out by roots or sown in mixtures more extensively than any other grass of late years. It has become established, and is spreading naturally, but it is not hardy enough for the district. Given good summer rains, excellent growth is made; but it is cut by frosts, and in a normal dry summer makes practically no growth away from water. However, it does fairly well around the dams and by permanent creeks. It has been sown in mixtures with lucerne and with Rhodes Grass, but without success as it cannot compete with either; neither will it grow where the others cannot.

Rhodes Grass, a much more hardy plant in resisting drought and in adapting itself to poor soils, promises better than any grass yet tried. It spreads rapidly by means of its long running shoots, as well as by seeds. Wherever planted or sown it has grown well, and although it has not yet undergone a trial of more than four years in the pasture, our experience up to the present has pointed to its coming through all tests with credit. Pigs seem particularly fond of it, rooting up the long running shoots. Frost quickly cuts it back.

Both Paspalum and Rhodes Grass require to be kept down or cut for hay, as they otherwise become tall and coarse. If allowed to get frosted in this condition, they are covered with a mass of dead herbage, which makes the young shoot in the spring difficult for stock to reach.

Of lucerne, "the king of fodders," the growing of which is one of the main branches of farm work in the district, nothing need be said here.

At the College a large number of grasses, both native and introduced, are grown in small plots. Observations as to the extent to which natural distribution goes on from these plots show that Rhodes Grass comes easily first. Others spreading freely are the Hairy Rhodes and Natal Red Top (both annuals), and the perennial Weeping Love Grass, as well as several grasses of little but ornamental use.

Of all the grasses grown, the Toowoomba Canary Grass is easily the most green and succulent during the winter. It is, in fact, the only grass that has shown no sign of being affected by frost. It cannot stand the dry heat of summer. It has not yet been tried in pasture; and having the serious defect of seeding poorly, is not spreading naturally.

With the exception of the White, the clovers have not proved successful in pasture. They cannot survive the dry periods. In a good spring, White Clover and Trefoil are common on the better soils, and persist until the dry weather sets in. The Clustered Clover, a relatively unimportant annual, is becoming common.

Hay and Ensilage.

Bush hay has been successfully made, and has proved of considerable value during periods of shortage of grass. Upwards of 230 tons were stacked by Major Phillip Charley on his Belmont Park Estate, near Richmond. It consisted mainly of Love and Spear Grass. It was cut with the grass too far on the dry side, a danger to be carefully avoided, the hay consequently breaking up into a fine chaff, difficult and unpleasant to handle. Similar grass has been made into silage at the College, as has also Summer Grass, that common annual weed-grass of cultivation, with excellent results.

Summary.

Introduced plants of proven value in pastures:—

Prairie Grass (*Bromus unioloides*).
Paspalum dilatatum.
Rhodes Grass (*Chloris Gayana*).
Lucerne (*Medicago sativa*).
White Clover (*Trifolium repens*).
Trefoil or Burr Clover (*Medicago denticulata*).

Useful native grasses :—

Couch (*Cynodon dactylon*).
Love Grass (*Eragrostis leptostachya*).
Blue Grasses (*Andropogon affinis* and *pertusus*).
Tall Blue Grass (*Andropogon refractus*).
Kangaroo Grass (*Anthistiria ciliata*).
Panick Grass (*Panicum effusum*, and other species).
Plume Grasses (*Dichelachne crinita* and *sciurea*).
Meadow Rice (*Microlœna stipoides*).
Wallaby Grass (*Danthonia penicillata*).
Ditch Millet (*Paspalum scrobiculatum*).
Water Couch (*Panicum obseptum* and *Paspalum distichum*).
Small-leaved Paspalum (*Paspalum brevifolium*).
Mat Grass (*Hemarthria compressa*).

FATTENING POULTRY.

BULLETIN No. 140, Bureau of Animal Industry, United States Department of Agriculture, by Alfred R. Lee, Junior Assistant Husbandman.

Mr. Lee has made an extensive inquiry into the results secured in large poultry-packing houses, to ascertain the cost of fattening poultry commercially, the gains with different grades and breeds, the value of different feeds, methods of feeding, season and period of fattening, and so on. Plymouth Rocks, Wyandottes, Rhode Island Reds, and other general-purpose breeds are preferred to the Leghorns and Minorcas; it pays better to fatten chickens than hens; from seven to seventeen days' fattening is enough (the shorter period for preference); milk-feeding and cramming with grain—these are some of the subjects described and illustrated. "Many consumers of poultry," says Mr. Lee, "do not know how delicious a well-fattened spring chicken is, but after once securing a bird thus fattened they will most likely ask for the same quality in the future." This looks like a profitable side-line for farmers in our grain and dairying districts—at any rate, it is worth looking into. But if they develop it, what will become of the thousands of White Leghorn cockerels which now reach the market from the suburban egg-farms? However, any interested reader can obtain a copy of the book from the Superintendent of Documents, Government Printing Office, Washington, D.C., U.S.A. Price not stated—probably about 6d.

LUCERNE AND HONEY.

IN the *Gazette* for September, 1911, a description was given of the methods followed at Ngoora Apiary, Nemingha, and it was stated that the output for the season just closed was expected to reach 12 or 15 tons of honey. Messrs. Adamson and Phillips now inform us that the production for the season was 610 tins of 60 lb. each, or 16 tons, from 150 colonies of bees. This excellent return should enhance the value of the advice given in the article mentioned.

Judging Cattle and Sheep Dogs.

ROBERT KALESKI.

During the past few years, and particularly since Farmers' Bulletin No. 38, on Cattle and Sheep Dogs, was issued by the Department of Agriculture, farmers and drovers have realised that one well-bred dog does more work than a dozen mongrels, and is a lot cheaper to keep; consequently, the demand for pure-bred cattle-dogs, barbs, and kelpies has become very keen, and values have risen from an average of 15s. a head to £5, the latter being a payable price to the careful breeder. Unfortunately, there are some so-called fanciers in and around Sydney who care nothing for the future of the breeds, and who are taking advantage of the farmers' ignorance of pure-bred points to sell all sorts of cross-breds and mongrels at extravagant prices. It is with the object of placing farmers in a position to protect themselves from fraud that I am writing this article. As is well known, I do not sell dogs myself, though I have bred, and still breed, some of the best in Australia; so I have no axe to grind in the matter. Mind, I think any breeder has a perfect right to sell his surplus stock; it is his making a trade of it that I object to, as in my experience it always leads to roguery. I could tell some funny yarns in this respect, if I had time and space.

I have probably judged more cattle and sheep dogs than anyone else in Australia, and will explain how it is done; so that the farmer, when buying a dog, can go over him, and make sure that he is getting the right thing. The accompanying photographs (taken by the Department when I was judging at the last Ladies' Kennel Club Show) will help to illustrate my meaning.

To start with, the farmer should learn off by heart the standard and scale of points given in the Bulletin referred to above. In drawing these up ten years ago, I based them on the requirements of a perfect working dog, so that one possessing them all is perfection for work and breeding. They were unanimously adopted by all leading breeders, the Kennel Club of New South Wales, and the original Cattle and Sheep Dog Club of Australia (founded by me, and now the Cattle Dog and Sheep Dog Club of New South Wales); so they have stood the test of time.

CATTLE DOGS.

Taking the cattle dogs, the first thing to do is to make the seller take his dog out into a clear space, at least as big as an ordinary judging ring, and trot it up and down in front of you a few times, to make sure that he is active and sound on his feet. No foot, no dog. If he waddles, rolls, or limps, he is no good to work. Take five minutes watching his paces; then, if satisfied, have him brought in, and overhaul him with the standard.

The Head.

First comes *the head.* Why should this be broad between the ears? Because it means a flat, wide brain-box, with plenty of room inside for brains, and no exposed surface for a hoof; instead of a narrow, high forehead, which has no sense, and splits easily when kicked.

Why should it taper to a point at the muzzle? Because a dog has to bite with that end of his head, and mighty quick too, and wants to have most of the weight at the other end, to control it better.

Why should the head be full under the eyes, and strong and muscular under the jaws? Because, to make his bite felt, he has to have all his jaw-muscles well developed, bulging up under the eyes, dingo fashion; and the jaws must be strong, or they will not stand constant work, and will break when kicked.

To see all this, get the dog facing you full, and look full at him, holding as shown. The head should look like a half-diamond, the nose at the point.

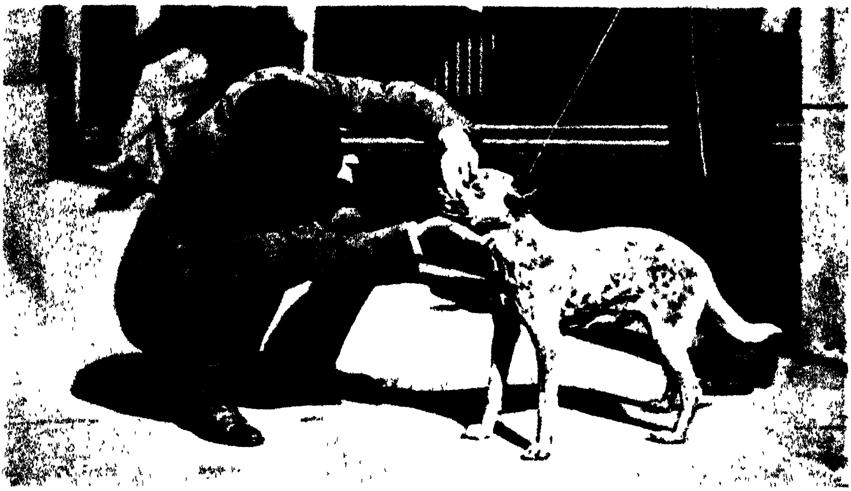


Fig. 1.—Judging the head.

Second, *the ears*. Why should these be short and pricked? Because they will always be in position to catch the slightest word or whistle. Why should they run to a point at the tip? Because the sound goes straight into the ear-drum; also, it is a sign of purity of breed (what we call the "dingo" or "diamond" ear). Why should they be set wide apart on the skull? Because, if set close, they have a tendency to point forward instead of outwards, and lop over; also only catching sound well from the front. Why should they be thick and have plenty of muscle at the butts? Because, when kicked or bitten in a fight, as often happens, the thick, well-muscled ear can stand it; the thin one cuts and flops. Also a thick-eared dog almost always throws prick-eared pups (if he has the dingo ear, of course).

Third, *the eyes*. Why should the eye be *brown*? Because it shows that the old "wall-eye," smooth-collie side of the breed is not predominant, and that the dingo side is. "Wall" or white eyes indicate a tendency to deafness and blindness. Why should the eye be quick? Because a slow-eyed dog cannot bite quick enough to escape being kicked; also a lazy-eyed dog makes a lazy worker. Still more important, a sleepy-eyed dog is generally *deaf*.

Why should the eye be sly? Because the sly eye shows the dingo strain, which never rushes, and calculates each bite to the fraction of a second.

This is the *head* (25 points). To go over, hold the dog as shown in Fig. 1, the left hand controlling the dog by the collar, so that he cannot bite (very few cattle-dogs can resist the temptation to snap at fingers), the right hand feeling the ears, jaws, and looking at the teeth. Always look at a cattle-dog's mouth when buying him, as a rash biter gets his *bottom* tusks kicked out, which spoils him for work; then his owner sells him to a "mug." The *top* tusks do not matter much. When a good dog is hopelessly severe we break his top tusks, so that he will not cripple stock.

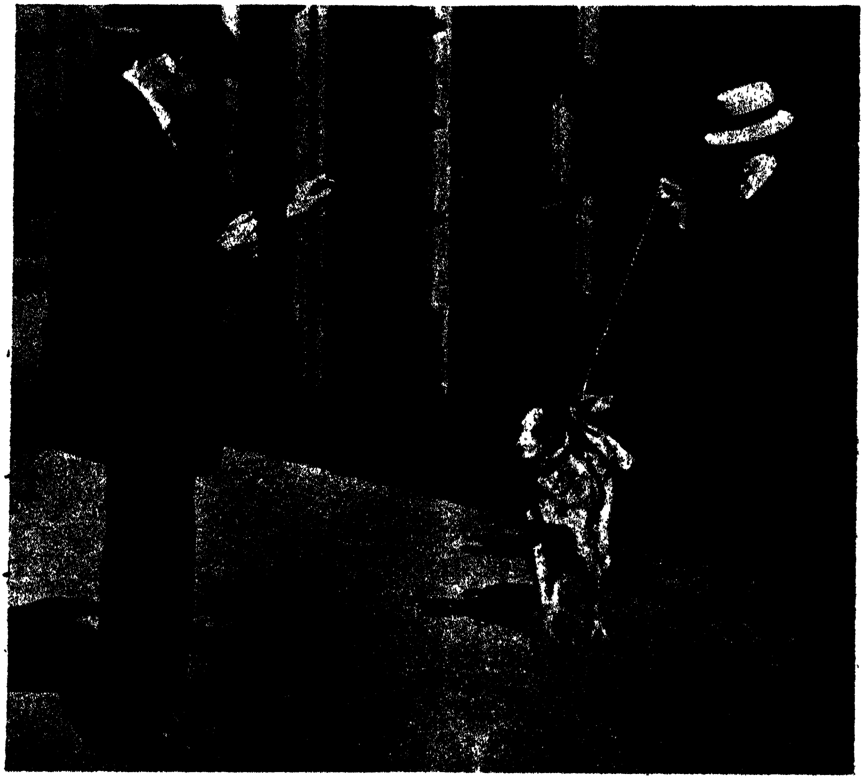


Fig. 2.—Looking over chest and forelegs and observing general appearance.

The head being passed, now release the dog, and stand in front for—

Shoulders.

Why well sloped? For speed and activity, of course. A straight-shouldered dog will not last at work.

Chest.

This should be deep, for good wind and sureness on his feet, but not wide like a bull-dog, or he will have no speed, and cannot drop to bite.

Now stand side-on to the dog for—

Legs.

Why should they be clean? Because a hairy-legged dog cannot work in heat and mud. Why fair bone? Because a cattle-dog has a heavy body to carry, and cannot do it with spindle legs. Why big muscles? Because he puts in as much foot-work as a boxer, and has to have the muscle to do it.

Back.

Why should the dog's back be straight behind the shoulders, and arched at the loins? Because it shows he can gallop like a racehorse, and swing his body to bite and drop without exertion. Why should the ribs be well sprung, or "casky"? Because it shows a good constitution, power of doing well on short rations, and ability to stand hardship. Why well ribbed-up, with good loins? This shows great control of the hind-quarters, in turning and twisting short.

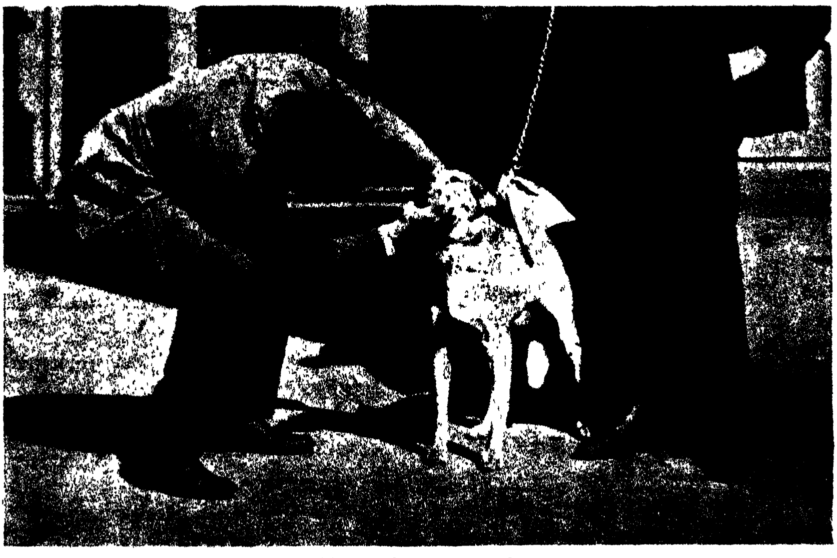


Fig. 3.—Examining teeth

Hind-quarters.

These must be strong, because they are the dog's engines—they drive him along; and if he is faulty there, he will not last in work. Back thighs must be well let down and bent (sickle-shaped) so as to give speed when needed. Why no dew-claws on hind feet? Because they catch in long grass and mud, drag the claw-sinew, and lame the dog. Why should the tail be of fair length, not too long nor too short? Because it balances the body when travelling. A short-tailed dog is too stiff in the loins, and cannot stretch his body out to gallop. A long-tailed dog is almost always slack-loined, and soon tires, because his loins cannot swing his body properly.

Why should the brush be bottle or dingo shape? Because this shape of tail balances the body best at either long, slow work or speed.

Height.

Why should the height be about 20 inches? Because years of experience have shown that this is the ideal height for Australian working dogs. Over that they soon tire in constant work, though good sprinters; under that they are too dumpy—all right for light, slow work, but useless when speed is wanted.

Now draw the tail out for brush (see illustration of kelpie), and open out the coat along the back and shoulders, running the hand *against* the coat.

Coat.

Why should the coat be short? Because a short coat does not hold dust and mud, and is much cooler than a long one. Why should it be smooth? Because a broken-haired dog is unsightly, and likely to be a cross-bred. Why should the under-coat be dense? Because the outer one is open to turn the sun's heat and let air circulate over the body, and the under one, or *fur*, protects the body from wet and cold. The two together make up a dense coat which defies sun and cold. My well-known dog "Nugget," for instance, has a perfect coat like this. He works right through a summer's day without exertion, and sleeps out in the winter on a wheat-bag in the open. In a hoar-frost he looks as if he had been powdered. He *won't* stop in a kennel, unless locked in.

Colour.

Why should the colours and markings be as indicated? Because, in the first place, they are a sign of purity of breed, and any dog not being marked like this is nearly certain to be cross-bred.

In the second place, dogs with these colours are always the best workers. The dark blue seems to suit the body best, the red or black the head, and the red the legs. An all-blue dog is never as hardy as those with the distinct colours. A light or whitey-blue dog is very easily kicked, owing to his conspicuous colour.

Why should the general appearance be that of a small, thick-set dingo? Because we get most of the good working qualities from that animal, and therefore the more the dog resembles one *in the proper colours* the more likely he is to be a worker.

Faults.

Over or under size.—In either case the dog cannot do his work.

Legginess.—A leggy dog cannot get down quick enough to bite and recover easily.

Flopping ears indicate bad distance hearing, hence failure to obey commands.

Overshot or bull jaw denotes the bull-dog or bull-terrier cross, which has no brains, is a wild biter, and very uncontrollable.

(*To be continued.*)

Clearing with Explosives.

HORACE B. FAVIELL, Bonville.

[In the *Gazette* for February, 1912, page 176, will be found an account of a demonstration by Mr. Faviell, before the members of the Bonville Branch of the Agricultural Bureau of N.S.W. Mr. George Marks, Inspector of Agriculture for the North Coast, is arranging to carry out some experiments at the Grafton Experiment Farm, as well as in conjunction with Mr, Faviell at Bonville. Experiments will also be conducted at other Farms, Meanwhile the following notes by Mr. Faviell should be of interest to settlers.—ED.]

The Value of Explosives in Clearing.

IT will be found that the chief uses to which explosives can be put with economy in clearing land, are in the removal of stumps, and in so shattering logs or standing trees that they burn more readily. Trees can be blown right out of the ground ; but, owing to their greater weight, they take more explosive than stumps. I therefore consider it more economical to put sufficient explosive under them to blow the earth out from around the roots, at the same time cracking and breaking the roots and butt of the tree. The cracks will extend from 4 to 15 feet up the trunk of the tree ; and after a week's exposure to the air in dry weather, even bad-burning timber will then burn readily. I have burnt down trees 7 feet in diameter at the ground in six to twenty-four hours, having used 5s. worth of explosives on some. These trees would have taken a week to burn down in the ordinary way—that is, digging the earth away from them, and drawing timber around them with horses or bullocks.

The economy of the method will be realised when I state that I have cleared 12 acres of land at a cost of £3 per acre, whereas an adjoining block of similar land cost me about £6 per acre to clear in the old way. This was on light red volcanic soil, overlying light clayey loam.

The method cannot be recommended in cases where timber burns right out of the ground, leaving no roots. But in this district I have found the saving in cost to vary from 25 to 50 per cent. on the usual methods of grubbing and burning. With practice, much better work can be done at less cost with explosives. The procedure should be varied to suit different timbers and different soils ; the exercise of a little judgment will be found profitable.

Sound timber, whether trees, stumps, or logs, will be shattered with better effect than hollow or rotten timber, as it offers more resistance to the explosives.

Condition of the Soil.

To obtain best results I find that the ground requires to be fairly dry. If it is very dry, the explosion is not quite so effective ; whilst if it is too wet, the force seems to act too deeply in the earth, instead of near and above the surface. In some districts, I am informed, best results are obtained when the ground is wet ; but that is not my experience, and I do not know to what degree it holds good.

Explosives Recommended.

For firing, a battery *guaranteed* to fire five or more shots is absolutely necessary for best results. It is possible to work in small timber with fuse and caps, but the method is not so satisfactory as the use of a battery.

The explosives which I have used are rackarock and rendrock. I consider the latter the better for earth holes, as it seems to take more roots with the stump; but I can recommend both. I have used a little gelignite, and it seems very good; I intend to give it further trials. Other explosives are worthy of trial, but I should not advise farmers to use dynamite, as it is more subject to chemical changes, particularly in hot climates.

If rackarock is used, insert the detonator in half a plug of gelignite for earth holes. Much better combustion will result if this is done.

Bursting the Timber.

When it is desired to burn trees or stumps level with the ground, or to burn sound logs, bore holes 1 to 2 feet deep into the soundest part of the timber, with 1 inch to 1½ inch auger, and charge same with ½ lb. to 1 lb. of explosive. A number of shots fired simultaneously with the battery will do very much better work than when they are fired singly with fuse. This method is suitable for Yankee grubbing, as it uses less explosive; but is not as good as the next method for getting rid of trees and stumps.

Clearing for the Plough.

To remove trees and stumps for the plough, put holes under the heaviest and soundest parts of same, 12 inches or more in depth, with a 3-inch earth auger or small bar and scraper. When placing the charges, take into consideration the lay of the main spur roots. Best results are obtained by using three charges or more, according to the size of the tree. Place each charge up against a big strong root, or better still in the fork of two roots. If it is not easy to get the charge against a root, ram small stones into the bottom of the hole, so as to make a sound bottom for the charge, as the more resistance obtained the better the results of the explosion. Do this before any explosive is put in the hole, or there would be great danger.

In some cases it is better to use both earth and wood holes, placing the latter in big spur roots; but I rarely do so, as it snaps the roots and leaves portion in the ground.

The charges should be carefully tamped with damp clay or earth, observing the proper rules, as there is considerable danger if they are neglected. Water tamping is not at all effective in wood, though it is in rock.

In earth holes I find 1 lb. of explosive about the minimum effective charge for large trees and stumps; but I have blown out small stumps with as little as ¼ lb. With well-placed charges, stumps frequently come out, shattered into many pieces, leaving few if any roots. When any remain they are so shattered that they burn easily.

A Warning.

A beginner will require 50 lb. of explosives to give the method a thorough trial. He should start on medium-sized sound stumps, as they are easier to operate on. Necessary care should be observed when handling explosives, and he should be extremely careful of the detonators. He should also bear in mind that large bits of wood will sometimes fly 150 yards. Detonators should never be *stored and kept* with explosives in the same receptacle.

[NOTE.—If a man wishes to keep explosives on his premises to any extent exceeding 25 lb. at one time, he must obtain a license under the Explosives Act, and build a proper receptacle for a magazine. The fee for the license varies; up to 300 lb. it is 10s. per annum. Before rackarock can be used, it is necessary to obtain another license to "manufacture" it (*i.e.*, dip the chemical in the oil). The fee for this is 5s. per annum.

The Inspectors under the Explosives Act are the local police, who will supply all information.—ED.]

BUILDING COTTAGES IN DISTRICTS INFESTED WITH WHITE ANTS.

IN a white-ant infested area, the ground upon which a cottage is to be erected should be carefully examined and no remains of stumps, wood, &c., should be left under it. The cottage should be built well up from the ground, so that one can get underneath the floors at all parts.

If the cottage is built on wooden blocks, a couple of pounds of salt should be placed in the bottom of each hole before the block is inserted. The blocks should be charred, and kerosene poured over them, and then each block should be capped with a zinc or tin plate. A pound of Paris green should be well mixed up in oil, and all the floor-plates should be treated with this mixture before the floors are laid down, as well as the blocks.

A useful wood for lining houses, and one which is almost ant-proof, is our native cypress or desert pine.—WALTER W. FROGGATT.

CUTWORMS ON CABBAGES.

THE best plan to kill out cutworms among cabbages and other growing plants is to spread baits of poisoned bran among them. Place about a teaspoonful of bait here and there all through the infested ground, half buried in the soil, close to the plants. The cutworms coming out of the ground feed upon the poisoned bran and die.

Formula: 1 oz. Paris green, mixed with 1 lb. bran. Mix it thoroughly in a dry state, and then add water to which a little salt has been added, and make it into a mash that will just hold together; then spread it as above.—WALTER W. FROGGATT.

Maize.

[Continued from page 35.]

A. H. E. McDONALD,
Inspector of Agriculture, North-West District.

Preparation of the Soil.

THE fitting of soil for maize is its manipulation in such a way that the conditions are secured which lead to good germination of the seed, and encourage vigorous subsequent growth until maturity is reached. Good germination and growth depend upon a sufficient supply of heat, air, moisture, and plant-food; and if any one, or all of these, are absent from the soil, neither germination nor growth is satisfactory.

By skilful preparation, a deficiency in the rainfall during the months when maize is making its growth may be remedied, while at the same time the supply of plant-food is increased. Few soils are so rich that they are not benefited by the transformation, before the crop is sown, of earthy material into usable plant-food by chemical and biological changes, which are directly influenced by the system of preparation adopted. If the system is efficient, large quantities are made ready for the crop, and even poor soils are brought into fertile condition; while if the system is bad, little or no provision is made for the crop, and it has to depend entirely upon favourable weather conditions during its growth.

In a practical paper such as this, it is not necessary to define the chemical and biological changes which increase the fertility of the land. It is enough to state that the presence of warmth, moisture, and air are essential to the processes, and when these are secured the changes take place. While these factors are necessary to improve the fertility of the soil, they are also essential to the growth of the plant, and, therefore, by the one process of preparation a double object is achieved.

Broadly, the conditions in the corn-growing districts approximate closely enough to make one system applicable to all, with some modifications according to soil, &c. In a climate such as ours, the main consideration should be the provision of a good supply of moisture. In perhaps no district is the rainfall during the growth of maize sufficient for its requirements. Even where good crops are obtained, generally better crops are obtainable, and a farmer should not be satisfied until they are secured; while in many districts where maize is grown, it is rarely that anything like an adequate amount of moisture is precipitated from the clouds whilst the crop is growing.

Effect of Preparation upon Inert Plant-food.

The growing plant absorbs from the soil, dissolved in water, many substances. The most important of these are nitrogen, potash, phosphoric acid, lime, soda chlorine, magnesia, sulphuric acid, and iron. These can only pass into the plant when in a state of solution; and although a soil may contain fairly large quantities of them, it may fail to produce good crops, simply because they are not soluble. Air, moisture, and warmth assist the chemical and biological processes which make them soluble; but the changes take some time. Therefore a good store of this plant-food should be prepared for the young crop before it is sown, by keeping the land moist, warm, and well aerated for a considerable time before the sowing season. This can be done by commencing the work of preparation some months before the actual sowing time, and adopting the right course of procedure right up to the time when the seed is sown.

The effect of this will be to produce near the surface a large quantity of soluble plant-food, which can be readily absorbed by the young plant. Instead of being retarded in its growth, the plant will then be forced along rapidly. A quick initial growth gives a strength and vigour to the plant which enables it to stand a good deal of hardship later in life.

Ploughing.

The main operation in the preparation is a thorough ploughing. It opens up the soil, and allows the ingress of the air, moisture, and warmth. When land has been carrying a crop for some months, it has become compact and impervious. Deep ploughing corrects this, and restores its porosity and friability. It brings life back to it again. The moisture and air also are able to penetrate to the subsoil, and exert a beneficial effect. Thus, larger quantities of rain are retained, and little runs over the surface, as frequently happens when, through shallow ploughing, a loose, shallow surface overlies a hard bottom.

This ploughing should be given about May or June, so that the soil will mellow right through the winter, and so that a long period will be allowed for the absorption of moisture. The frosts have a very beneficial mellowing effect upon ploughed land, and it should be exposed to them as long as possible.

The depth of ploughing depends chiefly upon the nature of the soil. The deeper the better, but much cold, sour subsoil should not be brought to the surface. A little can be brought up if the ploughing is done early, as it will mellow during the winter; but if a great deal is exposed, it will interfere with the friable, kindly nature of the surface soil, and germination will be hampered. Shallow soils can be improved by deep ploughing, but the process must be a very gradual one, and be spread over a number of years. It is doubtful if the improvement of the subsoil, said by many writers to take place, does occur to the extent claimed, but certainly some improvement may be made by careful manipulation. The mistake must not be made of supposing that exposure to the weathering action through a few winter months will correct the acidity of several inches of subsoil, and convert it into good soil.

Kind of Plough to Use.

Scarcely sufficient data is yet available from which an opinion may be formulated as to the best kind of plough to use. Much depends upon the nature of the soil and rainfall. Where the former is open, and absorbs rain readily, and where the rain is steady and is not precipitated in torrential downpours, probably it does not matter much whether a disc or a mould-board plough is used. Where, however, the soil has a tendency to pack, and heavy, stormy rains prevail, a plough is required which leaves the land rough and crested. The disc plough pulverises the soil too much, and lays it down flat, and is, therefore, scarcely suitable for the first ploughing. Special circumstances, however, such as the presence of weeds and rubbish, necessitate its use, and its facility overrides other disadvantages. On a maize farm both types are indispensable.

Too frequently the stalks left after the cobs are gathered are raked into heaps and burnt as the easiest way of disposing of them. This is absolutely ruinous to the fertility of the soil, as the carbonaceous matter which would serve to form humus, and the valuable nitrogen, go up in the smoke and are lost. These stalks, if ploughed under, add largely to the amount of humus and nitrogen in the soil. and thereby prevent the rapid exhaustion which now occurs where they are burnt.

Great difficulty is experienced in turning under stalks with the mould-board plough, but when the disc is used no trouble is encountered. The disc cuts up the stalks and buries them in such a way that decay rapidly takes place, and before the next sowing time they have been changed into mould.

The Time to Plough.

Time plays a most important part in the improvement of soil, and since the improvement is greatest when the land is worked, the commencement should be made as early as possible. Even where the soil is naturally as fertile as can be desired, early preparation is a necessity. It leads to the conservation of soil moisture, and there are very few districts in Australia where the rainfall during the growth of the crop is sufficient to supply its maximum needs and where the crop would not be benefited by storing, in the subsoil, moisture from rains previous to sowing. Even the North Coast, which is as well favoured with rain as any part of the State, has this season experienced a shortage during the main growing period, and yields have been lowered.

The fact that rain can never be depended upon to fall at a given time is in itself a reason for very early ploughing. The greatest amount of moisture can be saved when the rain falls upon land which is already broken up. It then soaks freely and readily into the subsoil. When the ploughing is done after the rain much of the moisture is lost. The ploughing should preferably be done in late autumn or early winter, as then all winter rains will soak into the soil, and it will also be under the weathering influence of the frosts.

After the first ploughing the further treatment of the soil depends upon many things. It is desirable to retain it in such a state that moisture and air will penetrate easily. Some soils run together after rain and become flat, compact, and impervious, whilst others retain a friable condition. The latter require little working, but the former require cultivation to restore friability and good texture. Besides preventing the ingress of air and later rains, the compact, crusted soil is in a condition that is favourable to rapid loss of any moisture that may have penetrated to the subsoil. The nature of the subsequent cultivation depends upon the degree to which the soil has run together. Some very unkind soils will require opening up again with the plough, as no other implement will restore their friability; but such soils are rather exceptional. Soils which are at all favourable will not require such treatment, and are, in fact, better without it. On these only a surface loosening is required, and this can be done quite efficiently by means of cultivators or scarifiers The spring-tooth implements are specially valuable for this work.

Much maize land is ploughed early, but in many cases it is ploughed a further two or three times during the winter. Except as before-mentioned, where the land has an abnormal tendency to run together, this is too much ploughing. It is unnecessary, and has, in many cases, a bad effect, as it exposes fresh, damp earth to the atmosphere, and causes a loss of moisture. It also creates large open spaces in the soil, which cause further drying. If the cultivator is used to merely stir the surface, much less ploughing will be required, and the land withal will be left in a better state for the crop.

Condition of the Land for Ploughing.

The efficacy of the ploughing depends very considerably upon the state of the land when it is ploughed. The main considerations are to see that the soil is all broken to a proper depth, and that it is in such a condition when ploughed that it will remain friable.

There is really only one objectionable condition of the soil which should lead to a cessation of work. That condition is when the land is wet, and is glazed by the plough. It cuts out like dough, and the effect of the plough is to puddle it into hard clods, which are extremely difficult to reduce. At a certain time after rain, when the soil has drained to some extent, the plough turns it up in a friable condition, and leaves a nice seed-bed. At such times it is most easily worked.

For the first ploughing, a dry condition of the land is only a drawback in so far as it renders ploughing more difficult. The fact that large clods are turned up is not at all objectionable, and is rather an advantage. These clods are not puddled—they are porous, and absorb moisture readily, and serve as a protection to the soil against heavy rains. They are of special value on steep land, as besides preventing compaction of the surface they tend to check washing of the surface. Instead of seeking to prevent the formation of clods, they should be encouraged as far as possible for surface protection. When soils containing a large proportion of clay are reduced to a very fine condition by the tilling implements, they are easily made too compact and impervious by heavy rains.

Surface Cultivation.

Until seeding time, the surface of the ploughed maize land should be kept in a friable condition, and all weeds prevented from growing. The best implements for this purpose are harrows and cultivators. They cover the land quickly, and do not stir it too deeply. The loose soil formed on the surface checks evaporation, and by carefully maintaining that condition a vast amount of moisture is held in the subsoil for the use of the crop. In addition, larger quantities of the plant-food constituents are brought into an available form, as moisture and air, which, as before-mentioned, play such an important part in improving the fertility, are held in the soil and subsoil for a longer period than is the case when cultivation is neglected.

The object in view is to keep the surface loose, and, therefore, cultivation should be given whenever it becomes compact. Heavy showers form a crust, which necessitates cultivation, and it is found that when such are frequent, more cultivation is needed than during dry weather. The farmer's ideal weather when he is fallowing his land is a good soaking rain just after ploughing, followed by dry, cool conditions. Under such circumstences the conservation of soil moisture is a simple matter. The subsoil is well saturated, and the well-cultivated condition of the surface, which prevents loss of moisture, is not interfered with by rain.

The Second Ploughing.

At seeding time it is necessary to again plough the land, and the success of the crop depends very largely upon how this is done. It may be said, as a general rule, that the second ploughing should be shallow. This applies principally when a thorough system of early preparation has been practised.

Several reasons render shallow ploughing imperative. Whilst the land has been in fallow, biological and chemical changes have been taking place actively, but principally in the surface soil. They proceed most rapidly near the surface, as it is there that the ideal conditions of a sufficiency of air, warmth, and moisture are found. The result of their activity is the formation of usable plant-food, and as this is required near the surface by the young plant, it should be retained there. If deep ploughing is followed, the sweet, rich surface soil is buried, and placed beyond the reach of the embryo plant, while unsweetened, lifeless soil is brought to the top to act as the seed-bed. Where the surface soil is retained for the seed-bed, a better germination is secured, and the young plants are more vigorous.

Further, firmness of the soil is desired by all plants. Their roots can then come in close contact with the soil, and are able to perform their function of feeding the plant. Where the soil is loose and open, only a portion of the surface of the root may be in contact with soil, and consequently it only partially does its work.

A firm condition of the lower soil is also most favourable to the rise of moisture by capillary attraction from the subsoil to the roots of the plant. If the soil is ploughed deeply, and thereby loosened, the air circulates very freely through the broken soil and dries out much of the moisture, while this loosened layer tends to prevent the upward rise of moisture, just as the loose mulch left by the cultivator does. As the roots of the young plant are in the top 6 inches of soil, this cutting off of the moisture which lies below is very inimical to growth.

Subsoiling.

Where it is desired that subsoiling should be done, the operation must be carried out in such a way that the subsoil is not brought to the surface. It should merely be stirred in its place. It is very doubtful, however, if subsoiling is profitable. The cost of the work, which is fairly considerable, does not appear to be balanced by the return. Soils which are only a few inches deep and rest on an impervious clay subsoil are most benefited. All deep soils, and those which lie on porous subsoils, will not be improved by subsoiling

Rolling.

The roller must always be used cautiously. Used carefully, it improves the physical condition of the soil immensely, but when used without thought it may do considerable harm. Farmers naturally like to see their soil "fine," and the roller is generally used to secure this condition. Many soils, however, may be made too fine. On the other hand, land is frequently very cloddy and open at seeding time, and as firmness is required, the roller must be used. It is only to secure a firm seed-bed that rolling should be done. It is a mistake to roll during the fallowing period, as the soil is made too fine and will probably set. If it is cloddy, rain and the cultivators will always break it down sufficiently.

If, however, the land is open and cloddy when seeding is to be done, the roller ought to be used to firm the soil, so that fine soil will be brought in close contact with the seed, and so that capillary attraction will be set up between the upper and lower layers of soil. Moisture then readily rises up from the subsoil to the roots of the plant. As, however, rolling draws the moisture to the surface, where it is lost by evaporation, a harrow should be used after it, or a light cultivation given, so as to leave a soil mulch and prevent this loss.

(*To be continued.*)

KILLING PADDYMELONS.

ON several occasions inquiries have been received by the Department of Agriculture regarding the best method of killing paddymelons. Mr. L. T. Uther, of Bonville, an ex-student of the Hawkesbury Agricultural College, supplies the following particulars of a method of poisoning them which he found very effective in his early years on the farm, and which he still uses at corn-planting for rats and bandicoots:—

> Grind corn fairly fine, and cover it with boiling water sufficient to moisten it through but not make it sloppy. Leave it in a warm place, covered up, for a few hours. Crush strychnine in paper to a fine powder with a bottle. Lay baits of about a teaspoonful of corn around the paddock, and sprinkle a very small quantity of the poison on them. I generally lay the baits on pieces of chip, which are easy to find, and bury all baits not touched. I found a small quantity of molasses mixed with the corn tempted the paddymelons to take the baits better.

Planting Trees for Shade and Shelter.

A. A. GOLLAN, Superintendent of Planting, Forestry Department.

ONE thing that strikes the observer about the homes of most of our farmers and settlers is the absence of shelter or shade trees. Everyone will readily admit that the country homestead where judicious tree-planting or preservation of natural trees has been practised, has a more attractive appearance than the bare, sun-burnt, wind-swept spot unfortunately so commonly met. The necessity of conserving or planting shade and shelter trees in the subdivision paddocks has not received the attention which it deserves.

That shade and shelter is appreciated by man and beast is beyond dispute. Apart from naturally timberless country, the bare appearance of the homestead and of the open wind-swept paddocks is due to various causes. Want of foresight in the original clearing operations, and lack of knowledge of what kind of trees will grow and provide the desired shade and shelter, are probably the chief causes. Nothing discourages a man so much as, after undertaking all the trouble of planting, to get no results, and to find out later that the species planted were quite unsuited to the district only adds disgust.

The stock-owner should recognise the value of shade and shelter. That little rough hill on your property, covered with stunted gum-trees, is worth more to you as it stands for shelter purposes than the small amount of grass it will grow should you decide to have it rung. To the settlers in naturally clear country, judicious planting is a necessity. Some of our native trees lend themselves for shelter purposes admirably, while some species from other parts of the world adapt themselves to the same purpose.

To those who desire to improve their property by the addition of shade and shelter trees, my purpose is to supply a few hints on planting methods generally and care of young trees, and to give the names of a few good trees for the purpose.

Preparatory Work.

Before planting, the ground should be well worked to a depth of 12 to 15 inches. Where this can be done by ploughing and subsoiling the initial cost for shelter breaks is reduced. The area proposed to be planted should be broken up early in the autumn months, leaving the surface rough. When ready to plant, run the harrows over. If the ploughing has been done early in the season, the ground should now be in good tilth and in proper working condition.

Open out holes sufficiently large to give room to spread the roots of the young trees evenly. In opening out the holes, put the surface soil on one side. When refilling the hole, the surface soil should be again put on top. Nothing is gained by bringing up the subsoil to the surface round the young plant. Loosen the subsoil as much as possible, but leave it underneath the surface.

Distance apart to Plant.

From 8 to 10 feet is a fair distance apart to plant trees for shelter belts. Some kinds may be planted much wider. However, the distance apart is not of such vital importance in shelter belts; the object is to get a breakwind as quickly as possible. Close planting forms a denser shelter than more open planting, but if the trees are to develop, thinning out must be done in the future. Thin early, before the bottom branches die off.

I would advise planting several rows to form breakwinds.

Planting Operations.

Assuming that the area to be planted is now ready, and the young trees are at hand, carefully spread the roots evenly in the hole. Fill in with surface soil, and tramp the ground firmly round. If water is available leave a slight depression round the tree; put a spadeful of soil round the collar or neck of the plant: then fill up the hollow with water. After the water has thoroughly soaked in, fill up this depression with dry soil and leave this as loose as possible. It acts as a mulch and retards evaporation. A tree so treated will have a certain amount of moisture near the roots for a considerable time afterwards. It is a good plan to dip open-rooted plants—*i.e.*, plants received from the nursery with no soil attached—in a stiff clay puddle before planting. Young trees taken from pots should have the ball of earth attached loosened at the bottom, and some of the roots spread out.

Pack the soil thoroughly up to plants taken from pots when planting. Young trees are often lost through neglecting this necessary packing of the soil to the plant. I have found young trees which were struggling to get a hold of the soil begin to grow after just trampling the soil firmly round them. Inexperienced planters are liable to fall into this error often from a mistaken fear of causing injury.

Best Time to Plant.

The months of June, July, and August are generally the usual months of the year for planting, but no hard-and-fast rule can be laid down. For trees that shed their leaves during the winter, the months mentioned are the only ones. Evergreen sorts, usually sent out by nurserymen in pots, can be planted either much earlier or later.

I would advise getting the planting done as early as possible. The young trees thus get the benefit of the winter rains, and stand a much better chance of becoming established before the heat of summer is due. In districts subject to severe frosts, planting operations may extend up to early in October. One advantage, however, of early planting is that should a tree fail, the failure may be noticed in time to replant again with a fair chance of success.

Care of Young Trees.

The young trees must be protected from stock, either by a system of tree-guards or, if planted in shelter belts, by running a line of fence round them. This protection should be afforded till the trees are sufficiently grown to be out of the reach of large animals. Rabbit-infested country will require closer protection by wire-netting the plantations. Any attention given, such as keeping the surface loose and free from weeds, will repay the trouble taken; it will serve a double purpose, assisting the growth of the trees and reducing the risk of injury by fire.

Suitable Kinds of Trees.

It must be distinctly understood that the following list of trees does not pretend to cover all the kinds that may be grown for this purpose. I have kept the list down to what may be fairly called "certainties." To simplify matters, I have divided the State into three areas, viz., Inland, Tablelands, and Coast.

INLAND DISTRICTS.

For inland planting the undermentioned kinds have a wide range:—

Sugar Gum (*Eucalyptus corynocalyx*).
White Cedar (*Melia composita*).
Aleppo Pine (*Pinus halepensis*).
Pepper Tree (*Schinus molle*).
Kurrajong (*Sterculia diversifolia*).
Sycamore, or Plane Tree (*Platanus orientalis*).
Carob Bean (*Ceratonia siliqua*).
Mulga (*Acacia aneura*).
Gutch (*Acacia catechu*).
Myall, or Ironwood (*Acacia stenophylla*).
Cypress Pine; Mallee Pine (*Callitris verrucosa*).
White Pine (*Callitris robusta*).
False Acacia (*Robinia pseudo-acacia*).
Honey Locust Tree (*Gleditschia triacanthos*).
Queensland Silky Oak (*Grevillea robusta*).
Tagasaste, or Tree Lucerne (*Cytisus proliferus*).

The last-named plant makes a good rough hedge. It is also a stand-by as a fodder plant in drought-time, and will grow on very poor land.

TABLELAND DISTRICTS.

Remarkable Pine (*Pinus insignis*).
Canary Island Pine (*Pinus canariensis*).
Stone Pine (*Pinus pinea*).
Cypress Trees (*Cupressus*, Sp.).
Japanese Cryptomeria (*Cryptomeria japonica*).
Black, or Green Wattle (*Acacia decurrens*).
Cootamundra Wattle (*Acacia Baileyana*).
Poplar Trees (*Populus*, Sp.).
Sycamore, or Plane Tree (*Platanus orientalis*).
Elm Tree (*Ulmus*, Sp.).
Willow Trees (near water) (*Salix*, Sp.).

All the above are fairly quick growers, *Pinus canariensis* and *Cryptomeria japonica* being the slowest of the lot. The last four named lose their leaves in winter, and are more useful as shade trees.

COASTAL DISTRICTS.

For the coastal districts the above-named will also be found satisfactory, but substitute *Pinus pinaster*, or Cluster Pine, for *P. canariensis* and *P. pinea*, and omit *Cryptomeria japonica* altogether. *Tristania conferta*, or Brush Box, should also be added.

Cowpeas in the Hawkesbury Agricultural College Orchard.

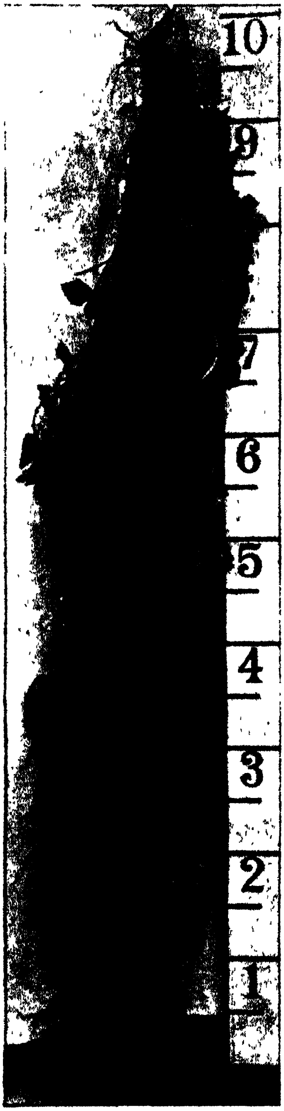
J. W. HADFIELD, Instructor in Agriculture.

A GREAT deal has been written in the pages of the *Gazette* from time to time on the undeniable value of the Cowpea. It is a profitable crop to grow in many parts of the State, either for seed or for fodder, while as a summer green manure it is unrivalled. Good crops are obtained at the College year after year on poor sandy soils, and the accompanying illustrations of its actual achievements are convincing evidence of its worth.

Especially is its value demonstrated in the orchard as a means of incorporating humus into the soil. When considered necessary, light dressings of manure are applied to the renovating crop, and allowance made for this quantity by applying correspondingly less to the fruit trees.

Two varieties thrive exceptionally well here—the Poona and the Black. The Poona is a late, upright-growing variety, the latter characteristic enabling cultivation to continue long after the Black has trailed across, and blocked the path between the rows. The seed is very small, necessitating the sowing of only about 4 lb., against 10 lb. of the Black. The yield, however, is light, the seed being produced in much smaller pods.

A common mistake is made of allowing the crop to reach maturity before being ploughed under. This should take place when the pods have just set, since at that stage the stems are soft and succulent, and easily cut through with the plough. If seed is desired, a small portion can be allowed to completely ripen, ploughing the rest of the crop in at the earlier stage.



A single plant of Cowpea grown in Hawkesbury College orchard.

The photographs illustrate cowpeas grown in the orchard between two-year-old trees. Only 12·3 inches of rain fell during their growth, and no manure was applied. To incorporate them with the soil, they are first rolled, and then chopped up either with a disc harrow or a corn-stalk cutter, and ploughed in with a single-furrow disc plough.

THE NOR'-WEST AND TROPICAL NORTH.

BULLETIN No. 13 of the Western Australian Department of Agriculture, by A. Despeissis, M.R.A.C., Commissioner for Tropical Agriculture. Over 100 pages, with maps and numerous plates.

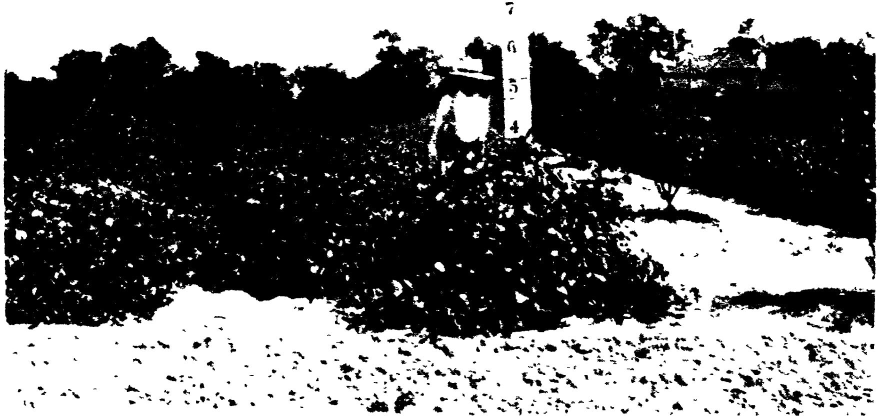
This Bulletin gives a vivid impression of the conditions in the northern portion of the Western State. Mr. Despeissis considers that, in the absence of indentured coloured labour, the size of pastoral holdings should be reduced so as to create settlements around which efforts could be made to bring land under cultivation. A nucleus of settlers with experience of tropical agriculture might be obtained from Queensland; but if it were necessary to go outside Australia and the British Islands, certain races of France, Spain, and Northern Italy would be suitable. Outdoor work for white men is pleasant enough in the cooler months, but a long midday rest would be required in summer. Station work is much less trying. The native blacks make good station hands, but are not numerous, and are dying out.

The author gives an alphabetical list of the crops which are found to thrive in the district. These are of course mostly tropical, though they include wheat (as far north as the Gascoyne), lucerne, maize, and rice, the last-named a crop which can be harvested with stripper or binder, is worth 1s. a bushel more than wheat, and gives double the crop. Irrigation is recommended in most cases, as the rainfall ranges from 8 to 27 inches. The further north one goes the greater the proportion of summer rain. The soils are deep and good. Water can be obtained in shallow wells, whilst artesian water is plentiful. Moreover, twenty rivers draining a stretch of country 2,000 miles wide, carry an enormous quantity of water from the mountains to the sea, and conservation for irrigation should be simple work.

With regard to stock, the district already carries half the sheep, and three quarters of the cattle in the State. Horse-breeding is not fully developed yet. Mules and camels have come to stay, and pigs run wild, and have often to be shot to protect lambs.

A disquieting fact, however, is that the climate seriously affects the health of white women, unless they can go south pretty frequently to recuperate. The present white population of the district is about 7,000 men, and 1,000 women, besides which there are 2,200 indentured coloured labourers on the pearling luggers, and some 600 coloured people, Chinese and half-castes, on shore.

This Bulletin is worth reading by all interested in the North, whether as prospective settlers or as students of those economic principles which are involved in the White Australia policy.



Poona Cowpeas, Hawkesbury Agricultural College Orchard, 1912.

Winter Dressing against Black Spot of the Vine.

M. BLUNNO, Viticultural Expert.

WE remind vignerons that the winter dressing of the vines against that fungoid disease commonly called "Black Spot" should be repeated every year a fortnight before the buds burst. All varieties, more or less intensively, are subject to it, and the disease thrives better in those districts where, during spring or summer, rains are not altogether scarce, and in any vineyard planted on low land, where, consequently, the air is moister.

The winter germs of the disease are hidden in the stem, and in the last year canes, on which are mostly visible those black ulcers that afford them harbour, and inside of which the germs are protected by several beds of cells. Even at a comparatively low temperature, if the moisture is sufficient, they can develop and originate those spores which spread the disease on the new shoots and on the blossoms and grapes.

The time, therefore, to act with the winter dressing is when the winter germs, having lacerated the beds of cells to let the spores start, offer no protection against the dressing.

The old formula is:—

1 gallon warm water.
5 lb. sulphate of iron.
½ pint sulphuric acid.

It is now recognised that the effect of this solution is mostly due to the sulphuric acid, and very little or nothing to the sulphate of iron; therefore a simpler and cheaper formula is suggested, which has proved to be just as effective.

This is a water solution of sulphuric acid of 6 per cent. in volume, which dose corresponds to a little higher proportion of the said acid than in the first receipt.

Practically, this second solution can be prepared with—

1 gallon of water.
¾ of a pint of pure sulphuric acid.

In the preparation of both the solutions care should be taken to pour the acid in the water little by little, or else the acid will spurt.

If the old bark is rubbed off previously the dressing will be more effective, and will also destroy many germs of other fungus or insect diseases. Neither of the solutions will do any harm to the buds if applied when they are closed and well protected.

The dressing may be applied with a swab or as a whitewash. All the canes cut off at the time of pruning should be collected and put away or burnt; if any of them are left on the soil, the winter germs may develop and burst off into spores even on canes severed from the stem, and be the cause of the spreading of the disease all the same, in spite of any winter dressing that we may have used. The application of both solutions delays the budding of the eyes a few days, which is an advantage in vineyards subject to late frosts.

I saw last year vines attacked by the "Black Spot" while blossoming, or a few days after the set of the flowers, the clusters being totally blazed. The above remedies are both preventive, and are successful and sure if applied, as I have said, a fortnight before the spring of the eyes; if applied later, these would be injured; if earlier, the case may be that the solutions will not affect the winter germs, finding them still well protected.

No reliable curative remedies can be given, but spraying in spring and early summer with Bordeaux mixture will be useful.

When vines have been very much affected by the disease in one season, it is certain that in the following spring, even under fair weather conditions, "Black Spot" in a more or less pronounced form will show itself. It is suggested that in such cases two applications of the winter dressing be made, one four weeks, the other a fortnight before the buds open into leaves. I know a vigneron at Cabramatta who applied the winter dressing *three times* last winter, which followed the 1910 spring and summer, during which "Black Spot" had devoured many vineyards, owing to continuous wet weather. The vineyard so treated, which I visited some time in November last year, was the picture of health, while "Black Spot" was doing a lot of harm in the vineyards where one application only had been made.

The dressing may be applied in a speedier manner than with a mop, by using a spray pump. Sulphuric acid eats copper; therefore, special spray pumps should be used, which are lead galvanised, lead not being attacked by sulphuric acid. Such pumps are of the Vermorel knapsack type, and are on the market. Another type of spray-pump can be used for the special purpose, the body of the pump being in strong glass, protected by wicker basket work

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

Green Orange-tree Bug (*Bibrorulus bibax*).—"A.C.B." (Moree): This large green plant-bug, with a large spine on either shoulder, is a common pest on orange trees in the northern parts of New South Wales, and does a great deal of damage by inserting its beak into the stalks of the young oranges and sucking up the sap, thus causing them to fall off. Spraying is of little value for the perfect bugs, because, among thick foliage like the citrus, it can hide, and its shield-like back throws off any contact spray. As the bugs suck up the sap of the stalk, and do not feed upon the surface, an arsenical stomach poison does not affect them.

In some of the orchards near Lismore, the orange trees are fumigated under a tent, with hydrocyanic acid gas, in the same manner as they are treated for scale insects. This is most effective, but if only a few isolated trees are to be dealt with, it means the expense of making a sheet or tent to cover the trees.

I should recommend jarring the branches, or shaking them smartly in the early morning (when the bugs are somewhat torpid, and drop very readily), having previously placed a sheet on the ground beneath. The fallen bugs can be shaken into a bucket of kerosene and water, or a tin of boiling water, and the work gone on with, until the whole tree has been gone over.

Jarring the branches (striking them sharply with a billet of wood round which a cloth has been wrapped, so that it will not bruise the bark), often brings insects down more quickly than shaking, and does not bring the fruit off.—W. W. Froggatt.

Preventing Smut in Algerian Oats.—"J.A.C.": We always use the bluestone and lime treatment for Algerian oats at our Experiment Farms, and also for the Farmers' Experiment Plots. The results have been satisfactory in every way, and I have not heard of any complaints. Probably there was some difference between the solution used by you and the one which we use. The pamphlet posted to you gives particulars of our treatment.—George Valder.

Foal with Enlarged Navel.—"O.W.": These umbilical hernias are quite common, and in the majority of cases they reduce themselves without any treatment. Drinking hot milk would not cause it.—Veterinary Officers.

Pruning Grape Vines.—"H.S.N.": The pruning system adopted in connection with grape vines exercises a strong influence on their cropping. Two systems of pruning are generally adopted, the long or cane system, and the short or spur system. This is carried out to meet the requirements of certain varieties. Generally speaking, staked vines of the table varieties are spur-pruned—that is, the previous season's wood is cut back to the main arms, leaving a short shoot or "spur" with two eyes. Upon the resulting growth the following season the fruit is borne. Most of the wine grapes, sultanas, currants, and some varieties of table grapes are long-pruned, *i.e.*, at least 6 to 8 eyes are left on the previous season's wood, because they bear farther out on the canes. In some districts, the Centennial and Black Prince varieties show the peculiar habit of the bunches having only a few nice, even-sized berries, the rest being small, hard, and green. You are recommended to obtain from the Government Printer, Sydney, a copy of the book on "Pruning"; price 1s., postage 1d.—W. J. Allen.

Citrus Orchards in Sandy Soil.—"W.A.Z." (Lower Southgate): It is advisable to have the land thoroughly cleared, all roots being run to a depth of 15 or 18 inches. After this is done it will be necessary to plough the ground to at least 8 inches. If the land is of a loose nature it will not be necessary to subsoil. However, by subsoiling a greater depth of soil is secured which assists in drainage and gives a larger area for conserving moisture. A second ploughing should be given, and the plough should be set to a depth of at least 9 to 12 inches, after which a thorough harrowing should be carried out so as to even up the ground ready for laying out and planting, and also to collect all old roots, rubbish, &c.

Your other questions have been answered by letter.—W. J. Allen.

Fowls Dying.—"Bungawalbyn": There is scarcely a doubt that your fowl-yard is infested with fowl ticks. See article by Mr. Froggatt in March, 1912, *Gazette*, for remedial measures.—George Bradshaw.

Cattle Chewing Bones, &c.—"R.K." (Dorrigo): The cattle are suffering from a disease known as Osteo-malacia, which is caused through an insufficiency of lime and various salts in the soil, and consequently in the feed.

For treating dry cows running in the paddock, a lick should be made up of salt, 40 parts; bone meal, 10 parts; and sulphate of iron, 1 part. If the cattle will take to this, the bone meal may be gradually increased to equal parts with the salt, or even more. The lick should be put under cover so as to protect it from weather. Cows which are being hand-fed should be given two tablespoonfuls of bone meal in the feed every day, whilst the addition of a certain amount of bran to the food is also useful.—Veterinary Officers.

Redwater in Cattle.—"A.K.": The disease occurs amongst cattle feeding in rough country on the coast and highlands. The cause is not known, and at present the only remedy to be recommended is to at once remove the affected animal or animals on to better class country. So far as is known, there is no danger of one animal contracting the disease from one already affected.—Veterinary Officers.

Greasy Heels in Horses.—"H.S.": Thoroughly wash the heels with a 5 per cent. solution of lysol in water, and then affix a pad of cotton wool soaked in the disinfectant, and bandaged in position When the cracks have closed up, take off the bandage and dust on a mixture of iodoform, 1 part; boracic acid, 5 parts; and starch, 20 parts.—Veterinary Officers.

Lumps in Cows' Udders.—"L.H." The cows are evidently suffering from a form of Mammitis. You should continue bathing, and as soon as the lumps become any size, open with a clean knife and thoroughly squeeze out the matter. It would be as well to treat each cow by giving her a drench of 1 lb. of Epsom salts with 1 oz. of ground ginger. If you are hand-feeding her, you are recommended to mix up a teaspoonful of sulphur and a couple of ounces of Epsom salts in her feed daily. Wherever the udder is sore, rub on a little boracic ointment.—Veterinary Officers.

Pony with Lampers.—"T.H.C.": The animal might be given a good dose of laxative medicine, such as ½ pint of linseed oil, to regulate the bowels, and one of the following powders might be given in the feed once daily, and be continued for one week.—Powdered nitrate of potash, 2 drachms; powdered flowers of sulphur, 2 drachms; powdered aniseed, 4 drachms. The diet should consist of soft, easily digested food, green food if procurable. An occasional bran-mash will be found beneficial, but no oats or maize should be fed.—Veterinary Officers

Rotating Wheat and Barley.—"H.O" (Duri): Provided the land is of good quality, a second crop of barley can often be obtained from the same area, but it is not considered good farm practice. As a rule, a rotation should be established, such as wheat one year, barley the next, and a fodder crop the third year. In dry districts, to obtain the best results it is also advisable to fallow one year, the fallow coming before the wheat crop.—Geo. Valder.

Mange in Horses.—"W.H.C.": Wash all affected parts with warm water and a little soda; then apply a mixture of sulphur, 1 part; lard, 4 parts. Apply this daily for three days, then wash off and repeat if necessary. Give the animal a mild purgative, say, ½ pint of linseed oil.—Veterinary Officers

Ophthalmia (Eye Disease) in Cattle.—"H.K.C." wrote, asking for a remedy for this disease, which was affecting several of his cattle. He was supplied with a pamphlet on the subject (*Gazette*, October, 1910, p 1023). He now reports that by isolation he was able to confine the disease to 5 cattle (2 steers, 1 cow and 2 calves). These he treated with boracic acid, with the result that the inflammation and scum have disappeared, and the animals appear to have quite recovered their sight.

Swelling on Bull's Face.—"E.O.A.": The bull is most probably suffering from Actinomycosis, commonly known as "Lumpy Jaw." So long as no discharge is occurring the bull is not likely to be dangerous to other stock. Treatment is often useful in early stages of the disease, but is always protracted and expensive. If treatment is to be undertaken, have the following mixture made up:—Biniodide of Mercury, 20 grains; Potassium Iodide, 1 dram; water, 1 pint. Give the bull 2 oz. of this mixture daily. It may be found that, after administering this for two or three weeks, the bull will go off his feed, there will be discharge from the eyes and nose, and he may lose condition. If this occurs, stop treatment until well again, and then recommence. In addition, rub the swelling with strong Tincture of Iodine.—Veterinary Officers.

Pinching Back Runners of Sweet Potatoes.—"T.D.L." (Rosebank): The plan is sometimes adopted, but there is some doubt whether it is beneficial, as experiments in this direction indicated that it made little or no difference in either the crop or the yield. To cut back the vines after they have made a strong growth, as indicated in your letter, would be more likely to have a bad effect than a good one.—Geo. Valder.

Setting of Navel Oranges.—"C.F.B.": There is no certain method of controlling the setting of Navel orange blossoms that has come under notice. The practice of ringing the trees by means of cutting a slight incision at the base near the ground, assists the tree to set its fruit, but care should be exercised in doing this work. A complete circle of the trunk of the tree is made, but the knife is only lightly inserted under the bark. This operation is performed just as the trees are bursting out into blossom. It is recognised in this State that there are two types of Washington Navel. One is no doubt true, but the other is said to be the Australian Navel, and its peculiarity is its heavy blossoming and shedding of the blossom, and shy bearing habits. For this reason it would seem that, as your trees have been given good attention, and have reached an age when they should be highly profitable, it would be better to re-work them to a suitable variety found growing in the district.—J. G. R. Bryant.

Treating Dead Stumps for Burning.—"C.F.B." Although many experiments have been carried out in testing methods for treating trees to ensure their burning easily, so far none of these experiments have proved satisfactory. The one generally advocated was boring a hole with an auger, putting saltpetre in the hole, and pouring in water and afterwards fastening it up. In some cases this seems to have had a good effect, but generally it was a failure —Geo. Valder.

Treating Green Timber for Burning.—"A.S." (Tamworth): The mixture of sulphuric and nitric acids which you quote appears to have had the desired effect in a few cases, but generally it has proved unsatisfactory. A number of other chemicals have been tried for the purpose, but few of them have been found of any value. I would recommend treating with arsenite of soda, as described in the weekly notes recently issued by the Department. See also *Agricultural Gazette*, January, 1911, page 25.—Geo. Valder.

Caustic Plant.—"T.G.F." (Parragundy): The plant is *Sarcostemma australe*, R.Br. The milky juice has been used for warts, but it is not of marked value, and the ordinary remedies of the doctor are more efficacious and convenient. The juice has also been used by Port Darwin natives as a remedy against small-pox, and by whites in the interior of New South Wales as an application to wounds. It has been stated that it will cure corns very quickly.—J. H. Maiden.

Weed in Barraba District.—"E.C.": The specimen is *Olearia ramulosa*, Benth., a blue flowering form, probably the variety *communis* of Bentham. It has no fodder value, so far as I can ascertain, and it certainly has no poisonous properties. If belongs to the daisy family, which is reputed harmless, but often has no known use, except for a little coarse browse.—J. H. Maiden.

Orchard Notes.

W. J. ALLEN.

MAY.

Get ready for Planting and Pruning.

THE month of June is a favourable time for planting out deciduous fruit trees, and it would be well if the land is not already prepared to put it in order with the least possible delay. The area to be planted should be cleared, well fenced, and worked to an even depth. Ascertain the varieties of fruits which find most favour on the markets, then select such kinds as will thrive best in your soil and climate. Lay the orchard out properly, giving the trees plenty of room, so that there will be a sufficient area from which they will draw moisture to keep them in good growing condition during dry years. After planting, leave the trees well worked around, and apply a little mulch if available. Do every part of the work thoroughly, and you will not be disappointed in the ultimate results. Lime is beneficial to soils which are sour.

From now until pruning is a slack time, and it is well to give the orchard a rest until that time. Stable manure may be carted in for weak trees. Drains, fences, gates, or any repairs necessary may be attended to.

Lemons and mandarins will soon be ready for picking.

Pruning may be commenced towards the end of the month.

Refilling Old Orchards.

Refills in deciduous orchards should be planted as early as possible.

Passion Fruit.

Keep the fruit picked up as it falls, as it is then in its best condition. Grade it nicely, and pack it in rows in the boxes. If growers are exporting any other fruit, it would be a good plan to send a few cases of passion fruit along in order to test their carrying quality, as, if we can successfully land this fruit on the markets of the Old World and get it well introduced there, there should be an unlimited demand for it. There are thousands of acres of land near the coast on which the plant does well, and where, with proper attention, it produces heavy crops of fruit annually. Unfortunately, the trial shipments we have made up to the present have not all turned out satisfactorily, but we hope in time that the difficulties may be overcome, and that we may yet create a demand for this delicious fruit.

Nursery Stock.

The wraps on all budded nursery stock may be removed at any time now.

Wherever it is necessary to enclose the orchard with wire-netting—and I am sorry to say that this is a precaution which cannot be overlooked in many parts of the State—it is best to use a good wide netting, with small mesh at the bottom, as it is wonderful through what a small mesh a young rabbit will get, as well as how high a fence he will scale. Therefore, if the orchardist wishes to preserve his trees from the attacks of these pests, he must see that the orchard is securely enclosed.

Fruit Fly.

Be very particular to pick up all fallen and infected fruit. Kerosene traps are excellent means for catching the fly. Shallow tins are preferable to deep ones. Saucers may be used if tins are not available.

I have to thank Mr. Brown, Mt. Kiera; Mr. Moulder, Camden; Mr. Senior, Penrose; Mr. Hewson, Penrose; Mr. McDonald, Kareela; and others, for sending me some very fine specimens of apples, &c.

APPLE TREES DYING BACK.

MR. W. GREETHAM, Buxton, writes:—"I have noticed in the newspapers of late a good deal of inquiry about apple trees dying back. I have been over twenty years in this district as an orchardist, and I have laid out, planted, and pruned in the following districts:—Buxton, Thirlmere, Balmoral, Hilltop, and Six Hills.

"I do not think that in any of these places the trouble is attributable to excessive rain or wet land. I think it is due to the long dry spells that affect the trees. I could prove to anyone in my own place, and in one or two others that I visit yearly to prune, that it is moisture and better cultivation that the trees need in all the districts I have mentioned. Manure is of very little use without rain or moisture. I never knew of these troubles in England, where we had plenty of rain.

"I do not think draining is going to assist us much, except in low, wet places; and I have had a good deal of experience in under-drainage in England, with pipes, thorns, sods, and stones. In Suffolk we used thorns and 2-inch pipes; in Lincolnshire we used pipes of various sizes, and turf drains. I know one orchard in the South Coast district which was under drained with pipes, and I believe it is a total failure."

Agricultural Bureau of New South Wales.

(NOTES COMPILED BY E. HARRIS.)

Branch.	Honorary Secretary
Bathurst	Mr. J. McIntyre, Orton Park.
Bonville	Mr. H. B. Faviell, Bonville.
Cardiff	Mr. D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coreen-Burraja	Mr. H. Vickers, Coreen.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. T. Glasgow, Kellyville.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Lawrence	Mr. E. T. Cooney, Lawrence.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, Penrose.
St. Mary's	Mr. W. Morris, Queen and Victoria sts., St. Mary's
Sackville	Mr. C. H. Britten, Sackville.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. T. Collins, jun., Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. S. Mann, Good Hope, Yass.

OBJECTS.

The objects of the Bureau are to hold regular monthly meetings at which members may read papers on various points of local or general interest in connection with agriculture, discuss the same, and exchange experiences; to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting: to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

Wherever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

The Government will subsidise the Branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a précis of any paper which may have been read and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

The Department is willing to supply to any branch requiring same, a set of insects, being the common pests of the district, if a glass-topped case, 10 in. x 14 in., which would cost about 7s., be provided. Arrangements could be made for the case to be obtained in Sydney.

Bonville.

Mr. Inspector George Marks will give a lecture on a date to be arranged at the end of April or the beginning of May.

Cowra.

A new branch is being formed at this place, and Mr. M. H. Reynolds, Manager of Cowra Experiment Farm, will give the initial lecture

Cundletown.

Mr. Veterinary Surgeon A. E. Massy will give a demonstration on the afternoon of 15th July, the subject being "Mammitis and Abortion in Cattle." It is to be hoped that there will be a large gathering of members and their friends to justify the expense the Department is incurring in sending a veterinary surgeon to Cundletown.

Dunedoo.

Mr. Inspector H. C. Wilson will arrange with the Secretary a convenient time on which to give a lecture on "Wheat-growing."

Inverell.

Messrs. O. Throsby and W. Pennington have joined this branch.

On the 12th April Mr. Inspector A. H. E. McDonald lectured on "The Preparation of Ensilage."

Kellyville.

The Government Entomologist, Mr. W. W Froggatt, visited Kellyville on the 18th April and gave a lecture on "Orchard Pests."

Little Plain.

At the regular monthly meeting held on the 28th March, the subject discussed was "What is the best use to which to put our farm lands in this district."

On the 11th April Mr. Inspector A. H E. McDonald lectured on "Silage-making."

Milbrulong.

Mr. H. Ross, Inspector of Agriculture, visited this branch on the 25th April for the purpose of giving a lecture to the members on wheat-growing.

Peak Hill.

Mr. Inspector H. C. Wilson is to lecture to the members of this branch on the 3rd June, the subject chosen being "Wheat."

Penrose.

Messrs. G. A. Ay and G. Simpson have joined the branch.

At a late meeting Mr. T. Hewson, jun., read a paper on "The Evaporation of Apples," in which he dealt separately with two different classes of evaporator, viz., factory and orchard. In Tasmania there were quite a number of evaporating factories which were run on commercial lines. These required the co-operation of a number of growers, and in this connection Mr. Hewson drew attention to the importance of co-operation amongst producers. Each factory evaporator would serve a district for miles around to which the growers could send their culls and windfalls, thus turning to good account what otherwise would have been wasted. Arriving at the evaporator, the apples are put through the peeling and coring machines, of which there are six to ten. These are power-driven, in some instances by steam and others by oil. The machine separates the peeled and cored apples from the skins and cores. The former are received on conveyers which take them to the sulphur box, which is constructed on the route to the slicing machines. In Tasmania it is the general impression that the apples should be sulphured while whole and not after slicing, it being claimed that the latter method causes the rings to become sodden and not so readily dried. This, however, has not been Mr. Hewson's experience. The slicing machine is a circular iron table about 2 feet in diameter, with a flange 3 inches deep on the outside edge. From the centre radiate knives which revolve and slice the apples very quickly as they are delivered by the conveyer. From the slicer, the rings or the slices are conveyed to the kiln or drying room, the size of which varies from 10 to 15 feet square. The floors are constructed with slats ¾ inch wide, and spaced about ¼ inch or $\frac{5}{16}$ inch apart. Under these run rows of 6-inch pipes which carry the hot air. On these floors the slices are spread in layers about 4 inches thick, and during the process of drying are turned once or twice with shovels. When finished the product is thrown in a heap to "even up." It is then packed and pressed into 1 lb. cartons, or 28 lb. and 56 lb. cases. There is absolutely no waste in the process, as the peelings and corings are spread on another kiln floor to dry, after which they are packed and shipped to Germany for the purpose of making German cider or some such beverage.

The orchard evaporator would undoubtedly be of more interest to the growers of New South Wales, and is one which any large orchardist should afford, as the method of treating inferior fruit is more commendable and profitable than sending it to the jam factories. Differing from the factory methods, the peeling and coring machine has an extra knife fixed, which slices at the one operation. As it is not practicable to sulphur a very small quantity, the slices are placed in a solution of brine, consisting of one ounce to one gallon of water. This holds the colour until a sufficient quantity is available for sulphuring. The length of time taken in drying varies according to the temperature of the atmosphere and the direction of the wind, the latter affecting the fire draught, but is about 10 to 14 hours at a temperature in the machine from 140 to 160 degrees. To decide the exact time when the fruit is fit to be removed is perhaps the most important operation of the whole process, and needs some experience. A guide is to take a handful of the product and squeeze it tightly; if it springs back into its original shape it is sufficiently dry. When firmly pressed in clean cases or cartons, the product finds ready sale in New South Wales at a figure which will prove to be profitable.

Stockinbingal.

Arrangements are being made for Mr. Inspector H. Ross to deliver a lecture at an early date, on a subject to be selected.

Toronto.

A demonstration on "Budding and Winter Spray" will be given to the members of this branch early in June.

Walli.

A most enjoyable picnic and social was given by the Walli Branch on 27th March. The events were keenly contested, and at the dinner the hall was crowded to overflowing

Mr. F. Ditzell, Experimentalist at the Cowra Farm, will deliver a lecture on "Wheat Culture" on 4th May.

Government Stud Bulls available for service at State Farms, or for lease.

Breed	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn	Pansy's Progress	Dora's Boy	Pansy 4th (imp).	Wollongbar Farm	*
,,	March Pansy	Earl March	Australian Pansy.	Grafton Farm	*
,,	Royal Pansy	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm	*
,,	Thessalian II.	Thessalian (imp.).	Egyptian Princess (imp.)	,, ,,	*
,,	Jamaica Jack	Sir Jack	Rum Omelette (imp.).	Wollongbar Farm	*
,,	Xmas Fox (imp.)	Silver Fox	Malvoisie	Berry Farm	*
,,	Kaid of Khartoum	Sir Jack	Egyptian Belle	Yanco Farm	*
Guernsey	The King's Mirror	Calm Prince	Vivid (imp.)	Casino	26 May, '12.
,,	Star Prince	Calm Prince	Vivid (imp.)	Lismore	31 July, '12.
,,	Sky Pilot	Prince Souvia	Parson's Red Rose (imp.)	Palmer's Island	15 Jan., '13.
,,	Prince Souvia	Vivid's Prince	Souvenir (imp.)	Casino	16 July, '12.
,,	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras	H.A. College, Richmond	*
,,	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '12.
,,	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,,	Claudius	Golden Star II.	Claudia's Pride (imp.).	Tweed River	12 Aug., '12.
,,	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes	Berry Farm	*
,,	Calm Prince	Rose Prince (imp.).	Gentle (imp.).	,, ,,	*
,,	The Peacemaker	Calm Prince	Rose Petersen	,, ,,	†
,,	King of the Roses	Hayes' King	Rosey 8th (imp.).	Rookwood	23 Oct., '12.
,,	Lauderlad	Laura's Boy	Souvenir of Wollongbar	Casino	13 June, '12.
,,	Royal Preel	Itchen Royal	Hayes' Lily du Preel (imp.).	Murwillumbah	10 Nov., '12.
Ayrshire	Jamie's Ayr	Jamie of Oakbank	Miss Prim	Wollongbar Farm.	*
,,	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose	Grafton Farm	*
,,	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry	Kildare II	Kildare (imp.)	Belvedere Bratha 3rd (imp.).	,, ,,	*
,,	Bratha's Boy	Aicme Chin (imp.)	Bratha 4th	,, ,,	*
,,	Rising Sun	Bratha's Boy	Dawn	Bathurst Farm	*

* Available for service only at the Farm where stationed.

† Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue Alteration of dates should be notified at once.

1912.

Society.	Secretary.	Date.
Dungog A. and H. Association	C. E. Grant	May 1, 2.
Dubbo P., A., and H. Association	F. Weston	,, 1, 2
Kyogle P., A., and H. Society	M. P Dunlop	,, 1, 2
Clarence P. and A. Society (Grafton)	G. N. Small	,, 7, 8, 9
Coonamble P. and A. Association	J. M. Rees	,, 8, 9
Lower Clarence A Society (Maclean)	A. N Smith	,, 14, 15
Walgett P. and A. Association	W. Neal	,, 15, 16
Nyngan and District P. and A. Association	R H. A. Lyne	,, 28, 29
Hay P. and A. Association	G. S. Camden	July 9, 10
Wentworth P., A., and I. Society	W B Crang	,, 17, 18
Deniliquin P. and A. Society	L. Harrison	,, 18, 19
Peak Hill P., A., and H. Association	A. Yeo	,, 24, 25
Condobolin P., A., and H. Association	A. Turner	,, 30, 31
Riverina P. and A. Society (Jerilderie)	J. Kennedy	,, 30, 31
Narrandera P. and A. Association	W. T. Lynch	Aug. 6, 7
Trundle P. and A. Association	L. Todd	,, 8, 9
National A. and I. Ass. of Queensland (Brisbane)	C. A. Arvier	,, 12–17
Coolamon A. and P. Association	E. Owen	,, 13, 14
Forbes P., A , and H. Association	J. H. Bates	,, 13, 14
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 20, 21, 22
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Corowa P., A., and H. Society	J. D. Fraser	,, 27, 28
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 27-29
Northern A. Association (Singleton)	F. A. Bennett	,, 28, 29, 30
Ariah Park P., A., H., and I. Association	J. N. Taylor	Sept. 3, 4
Germanton P., A., and H. Society	J. S. Stewart	,, 4, 5
Albury and Border P., A., and H. Society	W. I. Johnson	,, 10, 11, 12
Young P. and A. Association	G. S. Whiteman	,, 10, 11, 12
Cootamundra A., P., H., and I. Association	T. Williams	,, 17, 18
Cowra P., A., and H. Association	W. T. Fisher	,, 17, 18
Wellington A., P., and H. Association	A. E. Rotton	,, 18, 19
Canowindra P., A., and H. Association	G. Newman	,, 24, 25
Ganmain A. and P. Association	J. F. Ashwood	,, 24, 25
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25

1913.

Society.	Secretary.	Date.
Central Cumberland A. and H. Association	H. A. Best	Feb. 21, 22
Southern New Zealand P. and A. Association, Uralla	W. McCrossin	Mar. 4, 5
Camden A., H., and I. Society	A. Thompson	,, 5, 6, 7
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 11, 12, 13
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12, 13

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A Crop of Wheat at Turretfield Seed Wheat and Stud Farm, South Australia, on well worked fallow. Yield, 39 bushels per acre.

Rainfall for the year, 17 inches. Rainfall during growing period, 7 inches.

Stock on Turretfield Farm, South Australia.

VOL. XXIII. PART 6 JUNE 3, 1912.

Agricultural Gazette of New South Wales.

Economic Wheat Production in New South Wales.

WITH SPECIAL REFERENCE TO BARE WINTER FALLOW.

H. C. WILSON, Inspector of Agriculture, Western District.

BEFORE any crop is grown, the economic standpoint should be squarely faced. This depends upon—

(1) The constancy of a readily accessible market;
(2) The actual cost of producing the crop.

In the first particular, the wheat market is undoubtedly a most constant one, and although we are dependent on the price of wheat in London to fix the value here, the freights charged, both from the wheat-growing centres of the State to the chief ports, and from the ports to the home markets, are decidedly reasonable.

Secondly, the cost of production is a highly important factor in the popularity of wheat-growing. Although farm economy is prominent in some ways, and in many cases foremost on the farms of this State, the majority of farmers have not yet gripped the economics of wheat production. It is evident that throughout our wheat-producing areas, the idea of economy is to reduce the cost of working the land per acre. This is too often done regardless of the ultimate distress of the crop, and the result is a far too heavy cost of production per bushel, with frequently a scanty and irregular return.

Economics, as applied to wheat production, should stand in a broad sense for the practice of scientific wheat-farming, or in other words, the practice of realising the actual minimum cost of producing a crop of grain per bushel. This economy can be carried further and something definite and constant realised, by thorough and thrifty land preparation.

Fixity of Values.

If a land-owner can say that, through good farming, he has been able to fix something definite as the yield of his wheat areas, regardless of comparatively dry winters, then he can at once put a value on his land which would stand a great deal higher than the value fixed on land which has produced an irregular series of wheat crops, dependent upon the winter and spring rainfall during the growing period. This realisation of constant and definite wheat yields, and consequent stability of the value of a property, is rigid economy, and should be aimed at wherever possible by every land-owner and practical wheat-farmer.

To my mind there is no country in the world where wheat can be produced more cheaply per bushel than it can in parts of this State, if the correct preparation and cultivation of the land are attended to on strict and constant lines.

There are, of course, several knotty political problems, as there are in all young countries, that have great influence over the development of our lands, but under the existing conditions there is no reason why the total wheat yield of this State should not be ten times as great as it is at present. The fertile wheat land within easy distance of the railway and market, as yet in a virgin state, must be very great in New South Wales.

We all know that wheat-growing has been uplifted by the excellent results achieved by the late William Farrer, in cross-breeding and wheat improvement. But even with these wonderfully productive wheats at our command, we cannot afford to let their introduction cover the multitude of sins that are committed every season by the neglect of thorough land cultivation and needful application of artificial fertilisers.

Methods of growing Wheat.

I would like here to outline the methods of land cultivation in preparation for a wheat crop found to be more or less practised in the wheat areas of this State, and which have great influence over the actual cost of production. They are as follow :—

(1) Sowing in late autumn, directly after autumn ploughing ;
(2) Sowing in late autumn, after summer ploughing ;
(3) Sowing in late autumn, directly after a summer crop ;
(4) Sowing after a winter fodder crop, *i.e.*, land ploughed in late spring for wheat to be sown the following autumn ;
(5) In a two-year rotation with winter legumes ;
(6) In rotation with other cereals ;
(7) Finally, wheat sown after a thoroughly prepared bare winter fallow.

The first two methods of land preparation for wheat are, alas, too frequently practised where the conditions are entirely unsuited for them. Only where the rainfall is constant and sufficient, and the soil conditions are suited for the practice chemically and mechanically, should these methods be adopted. The wheat country in this State where these conditions of soil and climate prevail is not abundant, but the methods are practised much too frequently in parts of the State where the rainfall is too inconstant to ensure a good and definite yield.

Wheat sown in Late Autumn, directly after a Summer Crop.

This method of preparation of land for a wheat crop should also be discouraged, unless the rainfall is abundant and the land can readily stand a summer crop before wheat. Maize is grown with success in parts of the State, harvested as corn, or used either as a summer fodder or a crop for ensilage. The land is then ploughed in late autumn and followed by a wheat crop for grain or hay. Only under heavy rainfall and rich soil conditions is this practice advisable. Potato crops are also grown, followed by wheat, with success in a few localities.

Wheat sown after a Winter Fodder Crop.

The land is ploughed in late spring for wheat to be sown the following autumn.

This method can be practised with success in the central portions of the State, where the conditions of rainfall are generally good and the soil conditions suitable for the practice, but again, only where the situation and conditions permit the produce of this catch crop being turned into £ s. d., and showing a profit over cost of production. In some parts of the State where this preparation for the main crop, wheat, could be practised with success as far as the growth of the winter fodder crop is concerned, the conditions of situation and distance from market often cause financial failure. This is owing to the competition of stock-owners in placing on the market during the winter and spring months, fat stock from natural pastures, and from centres more readily accessible to market.

Wheat in Two-year Rotation with Winter Legumes.

This is a practice which is not frequently adopted in this State, but which to my mind could be made very profitable where the rainfall is fairly abundant, and the weather conditions mild and cool in the winter. If field peas were grown as a winter leguminous crop, and harvested for grain; then the land ploughed in the early summer months and sown with wheat the following winter, I think the practice would prove decidedly profitable. There is always a ready market for field peas in the State. They are of excellent feed value for all classes of stock, and large crops can be produced and readily harvested at a very low cost per bushel, if the conditions are suitable for their growth.

This legume, field peas, acts as a soil renovator and fertiliser in nitrogen, for the benefit of the following wheat crop, and rests the land in many ways that would not result from constant cropping of wheat after wheat without rotation.

Wheat in Rotation with other Cereals.

This practice should also be successful in the cooler and more uniform rainfall areas of the State; but the wheat crop should be preceded by some land-cleaning crop, or a bare fallow. Such a rotation would be-

(1) Wheat;
(2) Oats or barley;
(3) Bare fallow; followed again by wheat.

Or—

(1) Wheat;
(2) Oats or barley;
(3) Potatoes; followed again by wheat.

The latter rotation is a very heavy tax on the land, and could only be practised with success where the rainfall is abundant and the soil is particularly rich.

Field peas should be profitable if admitted in either of these rotations, in the first case between wheat and the other cereals, and in the second before potatoes.

Wheat in rotation with the other cereals could be made profitable in the more doubtful rainfall country if bare fallow was practised in the rotation two years in four, as follows:—

(1) Wheat;	(3) Oats or barley;
(2) Bare fallow;	(4) Bare fallow; followed again by wheat.

These crop rotation systems relieve the land of the great strain on its fertility that would result through growing the same crop on the same land year after year; and also allow the ravages of most insect and fungus pests to be in some way controlled by the farmer.

Loading Hay, Turretfield Farm, S.A.

Wheat sown after a well-worked Bare Winter Fallow.

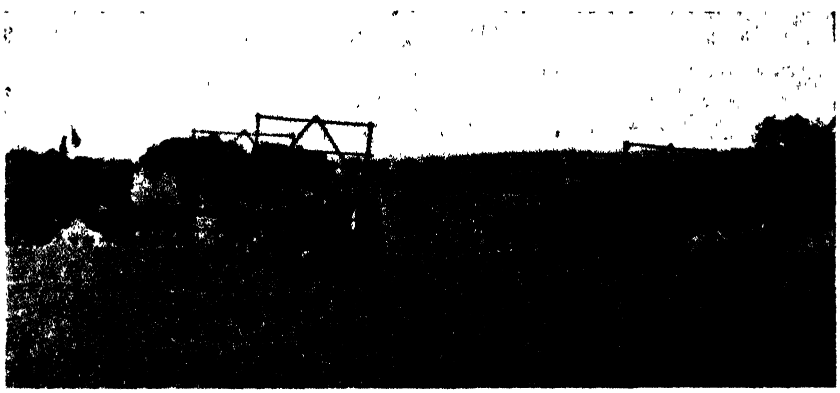
There is not a more efficacious system of land preparation for a wheat crop throughout the main wheat-producing areas of New South Wales than that of bare winter fallow. Farmers in the principal west and south-west wheat areas of this State, where the rainfall is at all uncertain, will never realise the full value or profit-carrying capacity of their wheat lands until this bare winter fallowing system has come to stay, and is practised before wheat without exception.

Although the many advantages of fallowing have been scattered broadcast by the State experts at different times amongst the farmers, there is still startling evidence that the practice is not being adopted to any great extent in the wheat-producing localities, where it should never fail to be predominant.

Bare winter fallow is not only necessary in the very scanty rainfall areas of New South Wales, but it is altogether warranted in the 20 to 30-inch rainfall districts of the State, because of the fact that in most of these districts the greater part of the season's rain does not fall during the winter and spring months, when the crop is growing and when the rain is most needed. In South Australia and parts of Victoria the practice of bare winter fallowing is recognised and respected almost as a law in wheat-farming. The year's rain, although very light in the wheat-growing areas of these States, falls more seasonably, and the main falls are recorded during the growing period of the crop.

With these facts in view, it is self-evident that to make wheat-farming return the greatest profit in most parts of New South Wales it is doubly important to conserve in the soil, through bare fallowing, the unseasonable rain which falls, and hold it in readiness for the use of the wheat crop that follows.

Every farmer is, or should be, conversant with the actual operations of fallowing, so there is no need for me to dwell lengthily on this routine; but I think there is a warranted reason for my *emphasing* the great necessity of ploughing thoroughly and as early as possible in the winter months after seeding, grasping every opportunity when the land is in a fit physical condition for work; and this ploughing should be followed by a constant system of spring and summer cultivation until the following autumn, when the wheat crop is sown.



Loading Hay, Turretfield Farm, S.A.

The Advantages of Bare Fallow.

Bare fallow before wheat is highly economical from a great many points of view. Besides the many advantages which it presents in renovating and fertilising the soil and conserving moisture, unquestionably resulting in a much better yield of wheat per acre in comparison with sowing wheat directly after a summer or autumn ploughing, the practice is economical from the following facts:—

(1) That the farm work can be distributed evenly throughout the whole year, thus enabling the farmer to keep constantly in work farm hands that have become useful and well versed in the ways of the farm, and who

would be hard to replace or obtain again if employment can only be found during the rush of the season, which results from the system of wheat sown after summer or autumn ploughing. This distribution of the farm work means also that—

(2) The farm horses are used steadily and continuously, and are not rushed for a few months of the year and turned out for the rest; and

(3) The implements and plant employed in the production of wheat are used more constantly, and therefore do not show depreciation through idleness.

(4) Moreover, the same amount or even more work can be got through during the winter months with less strain on the horses than if they are worked hard during the hot days of the summer or autumn. The land during these summer and autumn months is often too hard to plough thoroughly, and the attempt will mean great expense in wear and tear of shares, mould-boards, or discs, together with defective cultivation.

(5) Superphosphate will respond much more readily if applied to a wheat crop sown on fallow land, because the fallow land will be able to support the forced crop during the drier months of the growing period, through the extra amount of soil moisture that has been conserved.

(6) Finally, by promoting a constant and definite yield of wheat through fallowing, not only is the yearly net profit of the farm increased, but the land value will be made much more constant through lean years, and considerably higher than the value fixed on land that has been subjected to rough farming, and has produced a series of irregular crops.

Treatment of Stubble.

There is one disadvantage that faces farmers in hot dry localities, and provides some argument against experts propounding the principles of bare fallow; and that is the disastrous effect upon the vegetable matter of the soil, vegetable matter being an important factor in conservation of moisture. In my mind, this difficulty would be overcome by the simple method of always ploughing in wheat stubbles instead of the wasteful practice now in vogue of burning them. Although tests up to date have proved that burning stubble returns better crops for the first year or two, this cannot be the case when the ground has been cultivated for many years. It is beyond question that the ground into which heavy coats of stubble have been ploughed over and over again must come out on top in the end.

In conclusion, I feel that I cannot too strongly urge the extension of this fallowing system before wheat wherever it is at all possible to practice it in the wheat areas of New South Wales. In other Australian States, wheat land is valued at from £8 to £15 per acre, and is farmed alternately with wheat and bare fallow, which returns a very fair net profit over and above the rent on the land, together with the cost of production and marketing. Excellent wheat land within easy distance of the railway and market in parts of New South Wales is absurdly cheap in comparison with the values of similar land in the other States; and I feel confident that if the best known methods of farming were universally adopted in this State, a much greater net return per acre would be obtained from our lands.

Killing Green Timber.

[From "Agricultural and Pastoral Notes," supplied to the Country Press.]

How to Treat with Arsenic.

THE use of arsenic and caustic soda for killing green timber has attracted a good deal of attention within the last year or two, especially in the western districts of the State, where several farmers have employed the poisons with success.

The Auger-hole Method.

The Government Botanist has suggested to mix caustic soda and arsenic, in the proportions of two parts of the soda to one of arsenic, in a paste, and then, having bored a hole in the tree with an auger, fill it to about two-thirds with the paste and firmly plug it up again. The size and depth of the hole will depend on the size of the tree, the idea being that the poison must be introduced into the sap-system of the tree. If the work is done in the autumn the retiring sap will carry the poison into the roots of the tree, which should show the effects at once, and will probably be dead in a few weeks. Success depends largely upon the thoroughness with which the work is done. For instance, some farmers last year tried to poison hollow trees in this way, with the result that the paste percolated through the dead centre, and had no effect.

Ringbarking and Poisoning.

The system that has recently been extensively adopted by Mr. J. E. M. Gilmour, of Gilgandra, and by Mr. J. Sawyer, of Dubbo, combines ringbarking with the poisoning.

They cut an ordinary overlapping frill while ringbarking, and pour a solution of arsenic and soda into the cut. Mr. Gilmour testifies that the foliage shows the effect of the treatment within a day or two, and that in seven weeks' time he fired a large box tree, and found it burnt out splendidly.

The Preparation.

These gentlemen do not use caustic soda. They find ordinary washing soda as effective and much cheaper. They boil 4 gallons of water in a kerosene tin, and add 7 lb. of washing soda and 3½ lb. of arsenic, stirring it frequently as it boils, and then allow it to simmer quietly for an hour or two, stirring occasionally. Care must be taken to avoid getting the mixture on the hands, as it is a blood poison, and the fumes of the boiling mixture must also be avoided, as they have upset one or two farmers who have inhaled them. As the mixture cools, add water to fill the tin up again, and the liquid may then be applied hot or cold. Mr. Gilmour finds an old teapot particularly suitable. About a third of a cup of the mixture is poured into the ringbark cut, and after waiting a couple of minutes he adds a little more, to make sure. The "ringing" must be fresh. An old cut is of no use at all. Gloves should be used as a protection for the hands.

Effects on Soil and Stock.

Mr. Gilmour's experience is that soft, sappy timbers take the poison best, but it is harder to get it into tougher timber, and possibly the auger hole would be worth trying in such cases. The secret of the method is thoroughness, for slumming will prove itself very soon in a crop of suckers, which means further work. No anxiety need be entertained about the effect of the arsenic on the soil, for the quantity used is infinitesimal, and as for stock, Mr. Gilmour testifies that he had some horses in a small paddock during the work and a large number of sheep immediately afterwards, without any injurious results. However, Mr. F. B. Guthrie, Chemist of this Department, recommends that stock be kept off the land for three or four weeks, when there would be no danger.

The ringbarking should be done as near the ground as possible, and the axe should cut through the bark into the timber a little, in order to make sure that the poison does not escape between the bark and the wood.

MOSQUITOES IN CLARENCE RIVER DISTRICT.

MR. J. MCFARLANE, M.L.A., recently presented a letter from Mr. W. A. Zuill, of Lower Southgate, drawing attention to a serious plague of mosquitoes in portions of the district, which were inflicting much hardship upon human beings and animals. The Government Entomologist, Mr. W. W. Froggatt, visited the district, and found the conditions as Mr. Zuill had described them; but the clouds of mosquitoes were confined to certain areas, and along the river and creeks there were very few, and there were no immature ones in the water. This is remarkable, as the mosquitoes must have water to breed in, and there is no water in the spotted gum forests, where they were most numerous.

Mr. Froggatt suggests that in the early summer the insects breed out along the edges of the great swamps behind Lower Southgate and Lawrence, spreading out into many thousand acres towards Harwood; and these mosquitoes shelter in the forest, or are blown there by the winds from the coast, and infest the local surface summer rain water, in which their eggs would have plenty of time to develop before it evaporated.

Mr. Froggatt concludes with the following remarks:—

> These mosquito plagues will occur under ordinary conditions as long as these adjacent swamps remain undrained. A great deal could be done in the towns by a strict supervision of the water butts, tanks, and tubs, and oiling the surface of tanks where the water is drawn from below (spreading a thin film of kerosene oil over the water). It is remarkable that no larvæ were to be found in the creeks and lagoons, but this might be on account of the lateness of the season, all the large swarms having developed, and no fresh infestation of the water having occurred.

Cowpeas in the West.

H. J. KELLY, Manager, Nyngan Demonstration Farm.

THE first four months of the present year have proved, in the western districts, to be the driest consecutively within the recollection of the oldest residents, and so far in the fifth, no indications are apparent of any alteration in the dry conditions prevailing. The severity of such conditions has caused the pastures to become so dry that all stock which are depending solely on them for sustenance are rapidly losing condition, and in many cases have actually reached a state of starvation, through the lack of succulent fodder to relieve them from the indigestibility of the over-dry feed which they are forced to eat.

Since the 16th December, 1911, only 64 points of rain have fallen at the Nyngan Demonstration Farm, that small quantity being distributed in seven falls, which, owing to their lightness, would from a pastoral viewpoint, deteriorate rather than benefit the growth of grass and herbage caused by the beneficial rains of November and early December, 1911. On many holdings there is still abundance of dry feed, but so dry that on it alone, stock cannot subsist much longer; whereas if any succulent feed could be had to mix with it, fair condition could be retained for much longer. While these conditions are to be regretted, in that they spell disaster to many, who are possibly not in a position to make provision for such protracted dry periods, yet they have their beneficial aspect, in causing the land-owners in general to fight out their own salvation by providing, as opportunity offers, a reserve of fodder for the drought, be it near or distant, which every Westerner of any length of residence knows is sure to overtake him.

For the period at present under review, cowpeas would have proved eminently suitable for the production of succulent fodder to augment the drying pastures, and if planted extensively, would have prevented considerable mortality amongst lambs by supplying a nutritious and laxative diet at this critical period. I venture to assert that the loss sustained on many holdings this season would be equal to the amount required to clear, fence, and equip with the necessary implements, a cultivation area large enough to provide sufficient fodder to tide the flock over such a period with no losses from such cause.

An area of about 2½ acres was planted at the Nyngan Farm, on the 18th November, 1911, with Black Cowpeas, and from the date of planting until the 16th December following, the rainfall totalled 616 points. This gave them an excellent start, and thoroughly saturated the ground with moisture, causing luxuriant growth; but for the subsequent five months, only 64 points of rain fell, as above stated. Nevertheless, throughout the very hot and dry summer months, they retained their fresh appearance and made excellent growth, and are still in a green state, though of course, owing to the lateness of the season, some of the foliage is drying off. At present the best patches would give a gross weight of fodder of over 2 tons per acre, while had they been cut two months ago, they would have yielded about 5 tons per acre.

It will therefore be seen from this season's trial, that the growing of cowpeas for green fodder (or if not required for such, for making into hay or silage as a reserve for such times as it will be required) is well worthy of the attention of the western settlers, as it would cause lamb-raising to be much less speculative than at present. Of course there are other crops that can be profitably grown, and which may, under some conditions, be more suitable than cowpeas; but for periods such as the present, when there has not been sufficient moisture close to the surface to germinate autumn sown crops, it is probable that the cowpea for green fodder is without a rival.

IN THESE DRY TIMES

IT PAYS ——————→ to work ground well.

DEPARTMENT OF AGRICULTURE, N.S.W.
JUNE, 1912.

PLOUGH NOW

For SPRING CROPS —
Maize, Millet, Potatoes, &c.

Field Experiments with Wheat, 1911.

DETAILS of these experiments up to the end of the season 1910 were published in the *Gazette* last year. The present series of reports embraces the season 1911.

The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for a few years or less. Later, when results for say five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.

The reports upon Experiment No. 1—Variety Trial—are not yet ready.

II.—THICK AND THIN SEEDING TRIALS, 1911.

[For report for 1910, see *Agricultural Gazette*, July, 1911, page 598.]

Object.—To determine the most seasonable time to plant the crop, and the most suitable amounts of seed to use at different periods of the planting season :—

(*a*) For the production of hay, and
(*b*) For the production of grain.

This experiment is divided into three sections, one of which is sown in the beginning, the second in the middle, and the third at the end of the planting season.

The early planted section is fed-off at a suitable time, because, for the present, this is considered to be the best treatment for an early sown crop.

In order to obtain results that are not likely to be affected by peculiarities of the variety, this experiment is carried out with at least two varieties, as far as possible one a free, the other a scanty stooler. The varieties used are those which have proved suitable for the district in which the experiment is planted. Each section of the experiment requires three plots for each variety. These plots are seeded at rates which, for the district, are considered respectively thin, medium, and thick sowings.

COWRA EXPERIMENT FARM.

F. DITZELL, Experimentalist.

THIS experiment has been carried out in accordance with the general directions governing it at this and the other Experiment Farms.

The rotation adopted with this experiment is a two-course one, in which wheat alternates with a fodder crop. Two blocks are therefore required. Those reserved are F I and II, and D I.

This year portion of block D I was occupied. Prior to the commencement of the experiment this land had been cropped and manured in a uniform manner, so that it was in an even and suitable condition for the planting of this experiment. The land was cleared and broken up in 1905, and from then until the planting of this experiment it had been cropped as follows :—

1905 ..	.. Stud wheats without fertiliser.
1906 ...	... Black tares (or vetches), to which a mixed fertiliser, composed of superphosphate 4 parts and sulphate of potash 1 part, was applied at the rate of 54 lb. per acre. These tares were ploughed in when in flower.
1907 ...	... Fungicide experiments (wheat) without fertiliser.
1908 ...	... Algerian oats without fertiliser.
1909 ...	... Various wheat experiments fertilised with a mixture of superphosphate 4 parts and sulphate of potash 1 part, applied at the rate of 60 lb. per acre.
1910 ...	... Rape fertilised with superphosphate at the rate of 21 lb. per acre.

Preparation of the Ground.

The preceding fodder crop of rape having been fed-off with sheep over the whole of the block, the land was disc cultivated in preparation for wheat on and following the 29th November, 1910. It was disc ploughed about 5 inches deep on and following the 27th January, 1911. The land was then disc cultivated and harrowed when necessary until planting time, to maintain a loose mulch of dry earth 2 to 3 inches deep, and to destroy all weed growth.

Planting.

The different sections or plantings were arranged as per sketch A, and preparations were made to plant each as follows :—

(1) Early planting, fed-off, was to be planted from the 23rd March to the 7th April.

(2) Midseason planting was to be sown from the 1st May to the 14th May.

(3) Late planting was to be sown from the 7th June to the 20th June.

In each case a margin of fourteen days had been allowed to afford that elasticity which is always necessary when plans for agricultural operations are being made. In every instance this programme was adhered to, the early planting being made on the 31st March, the midseason planting on the 9th May, and the late planting on the 15th June.

In the case of the early and midseason plantings the ground was in good condition as regards tilth, moisture, &c., at planting time. In the case of the late planting the ground was very wet when the planting was made.

The plots were 16 links wide, to accommodate the width of the drill.

Two varieties were sown, namely :—

Comeback—An early variety ; and

Warren—A midseason variety.

Both these wheats may be called medium stoolers. Warren is a slightly better stooler than Comeback.

Sketch B, of one section or planting, shows the manner in which the plots were arranged in the carrying out of this experiment. The divisions shown on this sketch, which were planted with Comeback wheat, were cut out early for hay, to furnish tracks for the harvesting of the experiment.

To prevent the occurrence of bunt (smut) in the ensuing crop, the seed was treated with a solution of bluestone (2 per cent.) and lime-water.

The rates of seeding were about as follow :—

Thin seeding—30 lb. per acre.
Medium seeding—42 lb. per acre.
Thick seeding—57 lb. per acre.

Superphosphate was sown on all the plots at the rate of 42 lb. per acre.

The ground was not harrowed in any case immediately after planting, but was subsequently, whenever necessary to destroy a crust after rain.

Feeding-off.

The early planted section was fed-off rapidly and completely with sheep over the whole of the section on and after the 3rd May.

Observations during Growth.

On the 14th August it was noted that the germination was thicker on the heavier sown plots, this being, of course, in accordance with expectations. It was confirmed on the 8th September, though the difference was not so noticeable as before.

On the 30th October, both the Comeback and Warren were standing the dry weather very well, the latter being the better of the two in this respect. Comeback tip-withers readily in dry weather, while Warren does not.

Harvesting.

Before harvesting, the transverse division, which is shown on sketch A, was cut out for hay, and the plots were then reduced to $\frac{1}{14}$th of an acre in area by cutting off the ends, thus eliminating outside influences. One plot each for hay and for grain from each different treatment given in the experiment was harvested, and from these areas harvested, the computed yields per acre have been worked out. For publication the odd lb. in the hay yields have been discarded.

The plots required for hay were harvested with a reaper and binder when in full flower. The produce of each plot was then stooked on that plot, and was weighed when thoroughly dry, this giving the hay weights from which the yields per acre have been computed.

The remaining plots, left for grain, were harvested with a reaper and binder when the straw under the ear had turned yellow, were immediately stooked on their respective plots, carefully labelled and the sheaves tied together to prevent disturbance by the wind. The grain was threshed directly from the stooks as soon as possible after it had matured, and was then weighed. The weights recorded are therefore those of a farmer's sample. From these weights the yields per acre have been computed.

The Character of the Season.

The rainfall for 1911, as furnished by the records on the Farm, was as follows:—

		Points.	Points.
January	1	8	
	6	16	
	7	15	
	12	46	
	13	81	
	14	41	
	15	13	
	18	58	
	23	20	
	26	16	
			314
February	4	28	
	5	14	
	6	12	
	7	29	
	10	11	
	11	10	
	12	12	
	14	23	
	15	10	
	16	4	
	17	32	
	26	33	
			218
March	1	11	
	8	122	
	9	23	
	14	32	
	19	81	
	20	25	
			294
April	10	10	
	16	41	
	17	2	
			53
May	12	23	
	13	15	
	17	45	
	22	11	
	23	17	
	27	39	
	28	37	
			187
June	8	10	
	9	19	
	10	1	
	11	22	
	17	2	
June	19	76	
	20	15	
	21	5	
			150
July	8	42	
	9	17	
	11	3	
	12	8	
	13	35	
	14	5	
	17	4	
	18	12	
	21	9	
	30	2	
	31	3	
			140
August	13	25	
	14	2	
	21	2	
	22	2	
	23	4	
	29	14	
			49
September	3	55	
	4	27	
	5	20	
	16	18	
	20	3	
	22	3	
	27	14	
	29	2	
	30	19	
			161
October	16	20	
			20
November	1	62	
	2	34	
	23	54	
	25	16	
	28	72	
	29	86	
			324
December	1	16	
	2	149	
	4	120	
	16	5	
	26	30	
			320
Total for the Year			2,230

It will be noticed that although good rains were experienced early in the year the growing season for wheat was, generally speaking, very dry, the total rainfall from April to October inclusive being only 760 points. Good rains were experienced again later in the year, but the bulk of this rain was too late for the wheat crops, and had the effect of delaying harvesting operations and bleaching the grain.

Results.

The results are given in the tables that follow.

Tables I and III show the computed yields per acre, and also the percentage yields, from the various plots harvested for hay and grain respectively.

The percentage yields enable comparisons to be made more easily than from the computed yields per acre. As a basis for the working out of the percentages for each variety, the midseason medium-seeded sowing of each variety has been taken to represent 100 per cent.

These tables also show the variations due to planting at different times. The different times of planting may be arranged in order of merit, as follows:—

FOR HAY.

Comeback			Warren.		
Thin.	*Medium.*	*Thick.*	*Thin.*	*Medium.*	*Thick.*
Early.	Early.	Early.	Early.	Early.	Midseason.
Midseason.	Midseason.	Midseason.	Midseason	Midseason.	Late.
Late.	Late.	Late.	Late.	Late.	Early.

FOR GRAIN.

Comeback			Warren.		
Thin.	*Medium.*	*Thick.*	*Thin.*	*Medium.*	*Thick.*
Early.	Early.	Early.	Midseason.	Early.	Midseason.
Midseason.	Midseason.	Midseason.	Early.	Midseason.	Early.
Late.	Late.	Late.	Late	Late.	Late.

It will be seen from the above that, with these two varieties, the earlier plantings have given the higher yields of both grain and hay.

The exceptionally low yield of hay from the early planted, thickly seeded plot of Warren is remarkable. It may be possibly due to an error in the weighing, or some other detail. Where the midseason planting has beaten the early planting for grain in Warren, the differences are not great.

Tables V and VI show more clearly than do Tables I and III the variations in the yield of hay and grain due to the quantity of seed sown per acre. Arranged in order of merit, the most suitable quantities of seed to sow per acre for the different plantings, with these varieties, are as follow:—

FOR HAY.

Comeback			Warren		
Early Fed off	*Midseason*	*Late.*	*Early Fed off*	*Midseason*	*Late.*
Thick.	Medium	Thick.	Thin	Medium.	Thin.
Thin.	Thick.	Thin.	Medium.	Thick.	Thick.
Medium.	Thin.	Medium.	Thick.	Thin.	Medium.

FOR GRAIN.

Comeback			Warren		
Early Fed off	*Midseason*	*Late.*	*Early Fed off*	*Midseason*	*Late.*
Thick.	*Medium.	Thick.	Medium.	Thin.	Medium.
Medium.	*Thick.	Medium.	Thin.	Medium.	Thick.
Thin.	Thin.	Thin.	Thick.	Thick.	Thin.

* Equal.

No very definite conclusion can be drawn from these results; they are to some extent contradictory.

Tables II and IV, which refer to the average hay and grain yields obtained from thin, medium and thick seedings, and Tables VII and VIII, which refer to the average hay and grain yields obtained from early—fed-off, midseason and late plantings, in each case being for the two varieties grown in 1910 and 1911 respectively, are worthy of notice, representing as they do the average results obtained from these experiments to date. Tables II and IV show that the amount of seed applied per acre has only a small effect on the grain yields, and on the hay yields no effect; while Tables VII and VIII indicate that for both hay and grain production, but especially the former, with the varieties at present tested, the date of planting has an important influence; the earlier plantings giving higher yields than the later ones.

So far, from two seasons' results and from four different varieties of wheat in all, it seems that it is the date of planting that influences the yield, and not so much the rate of seeding. It will be most interesting to see if the results obtained from future years bear out these facts.

EXPERIMENT II.—THICK AND THIN SEEDING TRIALS WITH WHEAT, COWRA EXPERIMENT FARM, 1911.

A.—*General Sketch.*

(*a*) For Grain.		(*b*) for Hay.
LATE PLANTING. Plots 1 to 9.	Transverse division, cut out for hay before harvesting.	LATE PLANTING. Plots 1 to 9.
MIDSEASON PLANTING. Plots 1 to 9.		MIDSEASON PLANTING Plots 1 to 9.
EARLY PLANTING, FED-OFF. Plots 1 to 9.		EARLY PLANTING, FED-OFF. Plots 1 to 9.

Approximate area occupied by experiment, 4¼ acres.

B.—*Detailed Sketch of Each Planting.*

(*a*) For Grain.			(*b*) For Hay.	
9. Comeback .	DIVISION.	Transverse division, cut out for hay before harvesting.	9. Comeback .	DIVISION.
8. Comeback . ..	*Thick.*		8. Comeback .	*Thick.*
7. Comeback	*Medium.*		7. Comeback	*Medium.*
6. Comeback . ..	*Thin.*		6 Comeback	*Thin.*
5. Comeback	DIVISION.		5. Comeback .	DIVISION.
4. Warren ..	*Thick.*		4. Warren ..	*Thick.*
3 Warren	*Medium.*		3 Warren . ..	*Medium.*
2. Warren . ..	*Thin.*		2. Warren	*Thin.*
1. Comeback	DIVISION.		1. Comeback . ..	DIVISION.

Approximate area of each plot, 1/12 acre.

TABLE I.

Showing the computed yields of Hay per acre.

Section.	Date Planted.	Comeback. Date Harvested	Comeback. Thin. Computed Yield.	Comeback. Thin. Percentage Yield.	Comeback. Medium. Computed Yield.	Comeback. Medium. Percentage Yield.	Comeback. Thick. Computed Yield.	Comeback. Thick. Percentage Yield.	Warren. Date Harvested.	Warren. Thin. Computed Yield.	Warren. Thin. Percentage Yield.	Warren. Medium. Computed Yield.	Warren. Medium. Percentage Yield.	Warren. Thick. Computed Yield.	Warren. Thick. Percentage Yield.
			t. c. q.		t. c. q.		t. c. q.			t. c. q.		t. c. q.		t. c. q.	
Early—Fed-off.	31 March	2 October	2 6 2	112	2 5 2	109	2 10 1	121	6 October	2 6 2	123	1 18 3	103	0 19 2	52
Midseason	9 May	11 ,,	1 17 3	91	2 1 2	100	1 19 1	95	16 ,,	1 15 3	94	1 17 3	100	1 17 2	99
Late	15 June	20 ,,	1 5 1	61	1 4 0	58	1 6 0	62	21 ,,	1 12 0	84	1 8 1	75	1 10 0	79
Average	...	...	1 16 2	88	1 17 0	89	1 18 2	92	.....	1 18 0	101	1 15 0	92	1 9 0	77

TABLE II.

Showing the average Hay yields from Thin, Medium, and Thick Seedings for 1910 and 1911.

Year.	Variety	Thin. Average Yield for all Plantings.	Thin. Percentage Yield.	Medium. Average Yield for all Plantings.	Medium. Percentage Yield.	Thick. Average Yield for all Plantings.	Thick. Percentage Yield.
		t. c. q.		t. c. q.		t. c. q.	
1910	John Brown	1 17 1	82	2 5 2	100	2 6 3	103
1910	Federation	2 6 3	113	2 6 0	111	2 8 3	118
1911	Comeback	1 16 2	88	1 17 0	89	1 18 2	92
1911	Warren	1 18 0	101	1 15 0	92	1 9 0	77
	Average ...	1 19 2	100*	2 0 3	103*	2 0 3	103*

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* In Tables II, IV, VII, and VIII, the average percentage yields have been worked from the average of the previous column in each case, and the lowest taken as 100 for comparative purposes.

TABLE III.

Showing the computed yields of Grain per acre.

Section.	Date Planted.	Date Harvested	Comeback.						Warren.						
			Thin		Medium.		Thick.		Date Harvested.	Thin.		Medium.		Thick.	
			Computed Yield.	Percentage Yield	Computed Yield	Percentage Yield.	Computed Yield.	Percentage Yield.		Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.
			bus.		bus.		bus.			bus.		bus.		bus.	
Early—Fed-off.	31 March	4 November	17·85	99	18·32	101	18·67	103	7 November	21·47	100	22·63	105	19·83	92
Midseason .	9 May .	9 ,,	15·87	88	18·08	100	18·08	100	17 ,,	21·93	102	21·47	100	21·00	98
Late ...	15 June	17 ,,	13·65	75	14·47	80	15·05	83	20 ,,	14·93	70	17·03	79	16·10	75
Average	.	. .	15·79	87	16·95	94	17·26	95	.. ...	19·44	91	20·37	95	18·97	88

TABLE IV.

Showing the average Grain yields from Thin, Medium, and Thick Seedings for 1910 and 1911.

Year	Variety.	Thin Seeding.		Medium Seeding.		Thick Seeding.	
		Average Yield for all Plantings	Percentage Yield.	Average Yield for all Plantings.	Percentage Yield.	Average Yield for all Plantings.	Percentage Yield.
		bus.		bus.		bus.	
1910	John Brown	18·3	70	23·1	88	21·1	81
1910	Federation ..	22·5	87	24·0	92	25·4	98
1911	Comeback . . .	15·79	87	16·95	94	17·26	95
1911	Warren .	19·44	91	20·37	95	18·97	88
	Average	19·00	100*	21·10	112*	20·68	109*

* See footnote on page 477.

TABLE V.

Showing the variations in the yields of Hay due to the quantity of seed sown per acre.

Quantity of Seed sown per Acre.	Early Planting—Fed-off.				Midseason Planting.				Late Planting.			
	Comeback.		*Warren*		*Comeback.*		*Warren.*		*Comeback.*		*Warren.*	
	Computed Yield	Percentage Yield	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.
	t. c. q		t c q		t c q.		t. c. q.		t. c. q.		t. c. q.	
30 lb. = Thin Seeding...	2 6 2	112	2 6 2	123	1 17 3	91	1 15 3	94	1 5 1	61	1 12 0	84
42 lb. = Medium Seeding ..	2 5 2	109	1 18 3	103	2 1 2	100	1 17 3	100	1 4 0	58	1 8 1	75
57 lb. = Thick Seeding .	2 10 1	121	0 19 2	52	1 19 1	95	1 17 2	99	1 6 0	62	1 10 0	79
Average	2 7 2	114	1 15 0	93	1 19 2	95	1 17 0	98	1 5 0	60	1 10 0	79

TABLE VI.

Showing the variations in the yields of Grain due to the quantity of seed sown per acre.

Quantity of Seed sown per Acre.	Early Planting—Fed off				Midseason Planting.				Late Planting,			
	Comeback		*Warren*		*Comeback.*		*Warren.*		*Comeback.*		*Warren.*	
	Computed Yield.	Percentage Yield	Computed Yield.	Percentage Yield	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.
	bus.		bus.		bus.		bus.		bus.		bus.	
30 lb. = Thin Seeding	17·85	99	21·47	100	15·87	88	21·93	102	13·65	75	14·93	70
42 lb. = Medium Seeding ..	18·32	101	22·63	105	18·08	100	21·47	100	14·47	80	17·03	79
57 lb. = Thick Seeding ...	18·67	103	19·83	92	18·08	100	21·00	98	15·05	83	16·10	75
Average	18·28	101	21·31	99	17·34	96	21·47	100	14·39	79	16·02	75

TABLE VII.

Showing the average Hay yields from Early—Fed-off, Midseason, and Late Plantings, for 1910 and 1911.

Year.	Variety.	Early—Fed-off.		Midseason.		Late.	
		Average Yield for all Seedings.	Percentage Yield.	Average Yield for all Seedings.	Percentage Yield.	Average Yield for all Seedings.	Percentage Yield.
		t. c. q.		t. c. q.		t. c. q.	
1910	John Brown	2 6 0	102	2 5 0	100	1 18 1	84
1910	Federation	2 17 0	137	2 3 0	104	2 1 3	101
1911	Comeback	2 7 2	114	1 19 2	95	1 5 0	60
1911	Warren	1 15 0	93	1 17 0	98	1 10 0	79
	Average	2 6 2	137*	2 1 1	122*	1 13 3	100*

* See footnote on page 477.

TABLE VIII.

Showing the average Grain yields from Early—Fed-off, Midseason, and Late Plantings, for 1910 and 1911.

Year.	Variety.	Early—Fed-off.		Midseason.		Late.	
		Average Yield for all Seedings.	Percentage Yield.	Average Yield for all Seedings.	Percentage Yield.	Average Yield for all Seedings.	Percentage Yield.
		bus.		bus.		bus.	
1910	John Brown	21·5	82	23·5	90	17·5	67
1910	Federation	27·9	107	26·3	101	17·7	68
1911	Comeback	18·28	101	17·34	96	14·39	79
1911	Warren	21·31	99	21·47	100	16·02	75
	Average	22·25	136*	22·15	135*	16·40	100*

* See footnote on page 477.

WAGGA EXPERIMENT FARM.

R. W. McDIARMID, Experimentalist.

THE experiments commenced in 1910 were continued again this season, and in accordance with the general plan. An additional experiment was started, and experiments I and II carried out more completely.

An unusual amount of rain fell during the summer of 1910, which caused considerable weed growth on fallowed land, and such necessitated a second shallow ploughing prior to planting the experiments. Details of the cultivation are given with each experiment.

Rainfall.

The rainfall during 1911 was distributed as follows :—

	Points.		Points.		Points.
January ...	381	May ...	262	September ...	271
February ...	362	June ...	257	October ..	26
March ...	253	July ..	203	November ...	242
April ...	Nil.	August ...	50	December ...	156

Total, 24·63 inches.

The month of April recorded no rainfall, and that for October was very low. These two dry spells had a considerable influence on this season's results. The dry spell in the autumn—20th March till 9th May—caused a patchy germination in the early sown sections, and that of October affected the late sown crops. From the middle of May till the end of July there were many wet days, causing delay in planting and preventing feeding-off a section of the variety trial with sheep, as originally intended.

Harvesting Plots.

Prior to harvesting any of the plots a portion from the ends of each was removed for a dual purpose—to reduce each plot to an even fraction of an acre, and to remove from the portion considered the influence on the growth of the irregularities in starting and lifting the drill at each end. The divisions between the plots were calculated as portion of the plot owing to the influence of this unplanted piece of ground on the growth of the outside drills of each plot.

The varieties chosen for Experiment II were :—

Bunyip—An early variety and a bad stooler.

Zealand—A late variety and a good stooler.

The amounts of seed sown were :—

Thin	30 lb. per acre.
Medium	45 „ „
Thick	60 „ „

The season for sowing was divided as follows :—

Early sowing—6th April, 1911.
Midseason sowing—11th May, 1911.
Late sowing—26th June, 1911.

This year the experiment was carried out in its entirety.

Preparation of the Ground.

In the autumn and winter of 1910 this section of the paddock carried a crop of rape, which was eaten off with sheep. The ground was ploughed and harrowed in October and cultivated during January and February. In March it had a light ploughing, and was then worked down for sowing.

Planting.

The amounts of seed used, and the date of sowing are given above. Each plot was manured with superphosphate at the rate of 56 lb. per acre. During growth the midseason and late sections were harrowed, with advantage. The early planted section of this experiment was cut off on 22nd August, and a short second growth was made. Unsuitable weather conditions prevented feeding-off.

The cutting-off proved a failure, as the results show. Bunyip at the time of cutting was in flower, while Zealand was only about 15 inches high; hence the better recovery.

Results.

Variety.	Seed sown	Early Planting (cut off).		Midseason Planting.		Late Planting.	
		Plot.	Acre.	Plot.	Acre.	Plot.	Acre.
				HAY.			
	lb.	c. q. lb.	t. c. q. lb.	c. q. lb.	t. c. q. lb.	c. q. lb.	t. c. q. lb.
1. Bunyip...	30	0 1 20	0 6 3 12	2 0 6	1 12 3 12	0 3 22	0 15 0 16
2. ,,	45	0 1 8	0 5 0 16	2 1 0	1 16 0 0	0 3 18	0 14 2 8
3. ,,	60	0 1 18	0 6 2 8	2 0 14	1 14 0 0	1 0 0	0 16 0 0
4. Zealand..	30	1 0 14	0 18 0 0	3 0 0	2 8 0 0	1 1 0	1 0 0 0
5. ,,	45	1 0 0	0 16 0 0	2 2 24	2 3 1 20	1 1 14	1 2 0 0
6. ,,	60	1 0 22	0 19 0 16	3 0 14	2 10 0 0	1 1 10	1 1 1 20
				GRAIN.			
		lb.	bus.	lb.	bus.	lb.	bus.
1. Bunyip ..	30	3	·8	66	17·6	41	10·93
2. ,,	45	6	1·6	78	20·8	42	11·2
3. ,,	60	7	1·86	82	21·86	46	12·26
4. Zealand..	30	40	10·66	58	15·46	38	10·13
5. ,,	45	33	8·8	70	18·66	45	12·0
6. ,,	60	32	8·53	69	18·4	49	13·07

All plots are $\frac{1}{16}$ acre in area.

The results given in the above tables are those of one season's trial only, and should be regarded as such.

The results indicate that there is very little to be gained by sowing a good stooling variety thickly, especially when sown early or midseason. With such varieties as Bunyip, where the stooling is poor, there should be more seed sown per acre than with the good stooling varieties.

It will be observed that the yield of Zealand in the late section exceeds that of Bunyip for both hay and grain. The character of the spring largely influenced these results. The dry October caught Bunyip at a critical stage and materially reduced the yield, whereas the Zealand escaped somewhat owing to its not being sufficiently advanced to be affected.

BATHURST EXPERIMENT FARM.

J. W. SHAW, Experimentalist.

THIS experiment was continued at this Farm last year on the same lines as at Cowra and other Experiment Farms. Owing to there not being two paddocks available, it was decided to plant the experiment on the same area as in the previous year. Wheat was thus sown two years in succession, and this is responsible for the low yields.

The land was ploughed three times prior to planting. It received the first ploughing immediately after harvest, to a depth of 6 inches, the second ploughing six weeks later to destroy the weeds, and the third ploughing just prior to planting each section, namely, early, midseason and late sowings. After the last ploughing, the land was well harrowed, and was in splendid condition for sowing.

The three plantings were made on the following dates:—

Early sowing—27th March, 1911;
Midseason sowing—1st May, 1911;
Late sowing—8th June, 1911.

The same two varieties were used as in the previous year, namely, Bunyip (a very early variety and a sparse stooler) and Cleveland (a late variety and a rather free stooler).

Individual plots of each variety were sown for hay and grain at the following rates of seed per acre:—

Thin seeding—20 lb. per acre.
Medium seeding—30 lb. per acre.
Thick seeding—40 lb. per acre.

Each plot received a dressing of 30 lb. superphosphate per acre.

The germination in all sections was satisfactory, the most noticeable feature in this direction being the difference in time taken for germination between the early and late sown seed. In the early and midseason planted sections, the young plants were noticed from 7 to 10 days after planting, whereas in the late sown section the plants were not above ground for fully three weeks. This was due to the lower temperature of soil and atmosphere.

The early planted section was fed-off on 25th July, when the Bunyip wheat ranged from 12 to 18 inches in height, and the Cleveland from 8 to 10 inches. The feeding-off was done quickly and uniformly. The ground was trodden out of condition rather badly by the sheep, but was well harrowed with a sharp spiked harrow immediately after the sheep were taken off.

Prior to harvesting, all the plots were reduced to $\frac{1}{16}$ of an acre in area.

The attached table shows the yields of the different plots.

Remarks.

With Bunyip, which is typical of the sparse stooling varieties, better results were obtained from the plots sown thickly and at midseason. In the early planted section, which was fed-off, the yields of Bunyip were reduced by almost half as compared with the midseason section, which was not fed-off. Cleveland did not benefit by feeding-off, but the yields were not reduced to anything like the same extent as were those of Bunyip.

TABLE showing results of Thick and Thin Seeding Trials, at Bathurst Experiment Farm, 1911.

Variety.	Rate of Seeding per acre.		Early planting, 27th March, 1911. Fed-off 25th July, 1911. Area harvested, 1-16th acre.										Midseason planting, 1st May, 1911. Area harvested, 1-16th acre.										Late planting, 8th June, 1911. Area harvested, 1-16th acre.									
			For Hay.						For Grain.				For Hay.						For Grain.				For Hay.						For Grain.			
			Date Harvested.	Plot Yield.	Acre Yield.				Plot Yield.	Acre Yield.			Date Harvested.	Plot Yield.	Acre Yield.				Plot Yield.	Acre Yield.			Date Harvested.	Plot Yield.	Acre Yield.				Plot Yield.	Acre Yield.		
		lb.	1911.	lb.	t.	c.	q.	lb.	lb.	b.	lb.		1911.	lb.	t.	c.	q.	lb.	lb.	b.	lb.		1911.	lb.	t.	c.	q.	lb.	lb.	b.	lb.	
Cleveland ..	Thin ...	20	20 Nov.	158	1	2	2	8	29	7	44		20 Nov.	123	0	17	2	8	51	13	36		1 Dec.	104	0	14	3	12	37	9	52	
,, ...	Medium	30	20 ,,	144	1	0	2	8	48	12	48		20 ,,	193	1	7	2	8	58	15	28		1 ,,	117	0	16	2	24	48	12	48	
,, ...	Thick	40	20 ,,	112	1	0	0	0	46	12	16		20 ,,	199	1	8	1	20	62	16	32		1 ,,	127	0	18	0	16	46	12	16	
Bunyip ...	Thin ...	20	27 Oct.	44	0	6	1	4	27	7	12		27 Oct.	90	0	12	3	12	52	13	52		9 Nov.	63	0	9	0	0	29	7	44	
,,	Medium	30	27 ,,	45	0	6	1	20	20	5	20		27 ,,	92	0	13	0	16	53	14	8		9 ,,	88	0	12	2	8	34	9	4	
,,	Thick	40	27 ,,	59	0	8	1	20	26	6	56		27 ,,	104	0	14	3	12	52	13	52		9 ,,	106	0	15	0	16	36	9	36	

Summary of Results.

The results given in the table on page 484 show that in last season the best hay returns were given by sowing Cleveland wheat at the rate of 20 lb. per acre when early planting was done; but when the planting was midseason or late, 40 lb. seed per acre gave the best yield. Bunyip, however, gave the best results, no matter when sown, from 40 lb. seed per acre.

For grain, Cleveland gave best returns, sown early and late, from 30 lb. seed per acre, but in midseason planting 40 lb. seed proved best. Bunyip gave highest yield, when sown early, from 20 lb. seed; midseason, 30 lb.; late, 40 lb. per acre.

It is only when the experiment has been carried on for a number of years that it will be possible to draw final conclusions.

Rainfall, 1911.

The rainfall for the year was as follows:—

	Points.		Points.
January ...	... 381	July	... 163
February ...	... 271	August ...	... 70
March ...	... 150	September ...	... 183
April ...	... 34	October ...	... 155
May	... 164	November ...	... 374
June	... 112	December ...	... 390

Total ... 24·47 inches.

NYNGAN DEMONSTRATION FARM.

ERNEST BARING, Experimentalist.

The quantity of seed sown per acre is a matter of the utmost importance to the wheat-grower, particularly to the Western District farmer, whose success depends on comparatively light yields taken off large areas. To him the saving or waste of but a small quantity of seed per acre means quite a large sum.

Another consideration which makes the quantity of seed used of vital importance in this district, is the small amount of moisture on which the plants have to depend for their growth. If the plants are crowded, owing to over-thick seeding, they rob one another of necessary moisture, and the resulting crop is stunted in growth, and liable to burn off badly if a few hot dry days are experienced; whereas if the plants are not overcrowded they have a larger supply of moisture to draw from, and are consequently in better condition to withstand the heat. On the other hand, it is an almost equally bad mistake to sow too lightly, for though the plants grow well, a certain amount of the ground is not in use, and so the maximum yield is not obtained. A very thin crop is also rather difficult to handle with the reaper and binder. When cut, the straws fall unevenly and slip on the canvasses, causing uneven and ragged sheaves.

To give the experiment the fairest possible conditions, it was arranged to make sowing at three different periods during the planting season, early, midseason, and late. For this purpose, the experiment area was divided into three sections, each containing twelve plots, six to be harvested for hay, and six for grain. Two varieties, Steinwedel and Comeback, were sown, six plots of either variety in each section.

Three different quantities of seed were used, as follows:—

Thick sowing	50 lb.
Medium „	40 „
Thin „	30 „

The planting of each section was arranged as shown in the accompanying sketch.

Preparation of Land.

This area was cleared in 1911. Previous to planting it was ploughed (in February) to a depth of 6 inches with the disc plough, and was broken down with the spring-tooth cultivator, and harrowed. It was rolled prior to planting, and again rolled and harrowed after planting. All plots were manured with superphosphate at the rate of 30 lb per acre.

Harvesting.

Harvesting was done with the reaper and binder. Early and midseason hay plots were cut on 27th September; late ones on 9th October. For grain, early and midseason 1st November, late 12th November.

Results.

The results are shown in the accompanying table.

From the figures it will be seen that, taken all through, there is a slight advantage this season in favour of sowing lightly for hay, though there are some exceptions to this, notably the heaviest sowing of Steinwedel in the late planting section which gave 1,407·5 lb. of hay, while the corresponding yield in light sowing section was only 1,335 lb.

The difference in the grain yields is strongly marked, and is wholly in favour of light planting, the difference in yield between the heaviest and lightest sowings ranging to over 1 bushel per acre in some of the plots, which is a large amount when the general lowness of the yields is taken into consideration.

The results of this year's work cannot, of course, be taken as conclusive.

DETAILED SKETCH OF PLANTING.

Section B, Paddock IV.

PLOT 1.	Steinwedel ..	... 30 lb. seed per acre.
PLOT 2.	Steinwedel ...	... 40 lb. seed per acre.
PLOT 3.	Steinwedel ...	.. 50 lb. seed per acre.
PLOT 4.	Comeback ...	... 50 lb. seed per acre.
PLOT 5.	Comeback ...	.. 40 lb. seed per acre.
PLOT 6.	Comeback ...	... 30 lb. seed per acre.
PLOT 7.	Steinwedel ...	... 30 lb. seed per acre.
PLOT 8.	Steinwedel ...	.. 40 lb. seed per acre.
PLOT 9.	Steinwedel ..	.. 50 lb. seed per acre.
PLOT 10.	Comeback ..	.. 50 lb. seed per acre.
PLOT 11.	Comeback ..	. 40 lb. seed per acre.
PLOT 12.	Comeback ..	... 30 lb. seed per acre.
PLOT 13.	BUFFER PLOT.	

Results of Thick and Thin Seeding Experiment, 1911 (Nyngan Demonstration Farm).

Seed per Acre.	Early Planting.				Midseason Planting.				Late Planting.			
	Steinwedel.		Comeback.		Steinwedel.		Comeback.		Steinwedel.		Comeback.	
	Hay.	Grain.	Hay.	Grain.	Hay.	Grain.	Hay.	Grain.	Hay.	Grain.	Hay.	Grain.
lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
30	1745	239·75	1530	279·75	1625	260	1375	270	1335	247·5	1530	279
40	1610	206·26	1480	261·25	1557·5	185	1375	206	1305	199·75	1480	261
50	1635	209·75	1490	235	1475	187·5	1355	195	1407·5	152·5	1490	235

Hay and grain yields are given in lb. per acre.

A Visit to Iandra.

F. DITZELL AND J. T. PRIDHAM.

On Thursday, the 21st December, 1911, we visited Iandra Station at the invitation of Mr. Crawford Greene, the manager, to inspect the new comb-protector (recently patented by two share-farmers on this estate), "Giant" strippers, and motor-driven winnowers. These strippers and winnowers were specially imported by Mr. Greene from South Australia to increase the speed and reduce the cost of harvesting operations.

The comb-protector was first inspected. This device was invented by Mr. L. N. I'anson, a share-farmer on Iandra, in 1910; and as it proved to be a great success on his own farm, he acted on the advice of a neighbouring farmer, Mr. E. E. Southwell, and patented it, taking Mr. Southwell into partnership with him.

This comb-protector enables crops which are dirty with rubbish, such as star and black thistles, cockspur, wild mustard, &c., to be stripped thoroughly and expeditiously. The protector is set in position No. 1 when stripping clean patches, and as a patch of rubbish is approached, the handle is released, and the rubbish carries the protector into position No. 2, deflecting all rubbish below the comb while the stripper or harvester passes over it, to rise up unharmed behind the machine. The wheat heads simply pass through the prongs of the protector, and are stripped. These prongs, which are attached to a piece of piping worked by a handy lever, are wide enough apart to allow heads of wheat to pass between them to be gathered by the comb, but they are sufficiently close to catch thistles, &c.

This protector may simply be set out in front if so desired, and it will then work as a "false comb" in tangled crops, straightening the wheat out considerably. Other advantages gained by the use of this contrivance are a clean comb, elevator, and riddles, so that less blast is required, with the result that no wheat is blown off the riddles, and the wear and tear of the machine is reduced. No time is lost through choking of comb, elevator, or riddles, and the wheat is free from rubbish seeds. The cost of cutting thistles before stripping, and the consequent loss of wheat by trampling down in the process, are done away with. It is really wonderful how few heads this device leaves when stripping amongst rubbish; it can safely be asserted that it will strip in an extremely dirty crop, with an infinitesimal loss from the missing of wheat heads around thistles and other weeds. It is seen at its best when the crop is standing up straight; in a twisted crop some of the heads which are bent across the front of the protector would naturally be missed, but the loss in this direction would be small.

The fitting of this contrivance does not interfere with the choke-cutters on harvesters and strippers when such are retained for wheat chokes; there are no rubbish chokes after these protectors are fitted. Full particulars as to prices, &c., are obtainable from the patentees, Messrs. I'anson and Southwell, Greenthorpe, New South Wales.

To sum up, the protector fully justifies the claims made for it, and should be indispensable to all farmers troubled with dirty crops. It cannot, for obvious reasons, be recommended for use in oat crops. What is so surprising is that so simple a contrivance was not patented years ago.

The "Giant" strippers were next visited. These proved to be 8 feet strippers, possessing only the main drum (no second or peg drum), which means lighter draft. These strippers are pulled all day long by four horses or, with change of horses, two shifts of three horses each. The two features peculiar to these strippers are—first, the light draft, as explained above; and, second, the absence of "side draft." The latter is effected by an ingenious arrangement of four tin flanges in the off-side of the throat of the stripper, just behind and above the main drum, which deflects the bulk of the wheat to the near side so that the bulk of the weight is directly behind the horses.

The most economical way of working these strippers is to have two machines and drivers at work, together with a man to empty them while the drivers are oiling up; his duty to include changing horses, attending to lunches, &c. In this way the strippers lose the minimum amount of time, and take off 16 acres per day, and even more.

The contents of the strippers are piled up into large heaps to await the coming of the winnower. The heaps should be formed up to a high cone, and they are then practically rain-proof. Several such heaps were examined, and they were unharmed, although about 5 inches of rain had fallen since they were made.

Finally, the motor-driven winnowers were inspected. These comprise a powerful threshing drum, a large and effective winnower, and an 8-h.p. De Dion engine combined, and they deal with the grain and chaff direct from the heap. The elevators for feeding and for delivering the grain into the bags are both on the wheel principle. The feed goes into a large wheel near the ground instead of a hopper at the top, thus minimising lifting. The powerful drum ensures thorough threshing, and a first-class sample is turned out. Since the engine forms part of the machine, there is very little trouble in setting. Bag dumpers are used to ensure thorough filling of the bags. Seven men were engaged upon each machine—three feeding, two attending to the bags and dumpers, and two sewing bags.

Up to the time of our visit, these machines had not done an unbroken day's run on account of the necessary shifting from heap to heap, but the best record was two shifts and 755 bags threshed in two days. On testing the pace of one of these machines with a watch, it put through about a bag per minute. Of course they could be run with a smaller gang of men, but at a sacrifice of speed. There were, in all, on this estate, nine such strippers and two motor-winnowers at work. Mr. Greene is trying them just as an experiment this season, and, if successful, they will be extensively used in the future.

As Mr. Greene points out, the use of these machines will reduce the cost of plant and horses to share-farmers considerably, and he illustrates it in this way: If a man buys a harvester it costs him about £90, and he then requires ten horses—two shifts of five each—which cost another £400, or £490 altogether. If, instead of a harvester, he invests in a large stripper, the outlay will be £70 for the stripper, and £240 for six horses—two shifts of three each; totalling, £310. This means a saving of £180 for every harvesting machine required. The winnower, complete, costs £165 f.o.b., Adelaide, S.A.; but this is purchased by the proprietor, and he threshes all the share-farmers' wheat at a cost guaranteed not to exceed 5d. per bag.

In conclusion, it may be mentioned that the total area of Iandra Station is 33,000 acres, of which about 25,000 acres are cultivated. In 1910 the area cropped was 18,000 acres, and about 5,000 acres were fallowed for the succeeding season. In all, there are forty-seven share-farmers on this estate.

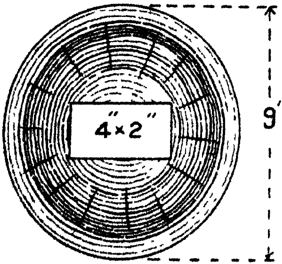
The following few notes, in a general way, may be of interest:—

Oats do remarkably well in most seasons, but it is advisable to begin sowing in March. Algerian oats are grown exclusively, and it pays better to sell as hay than to thresh for grain.

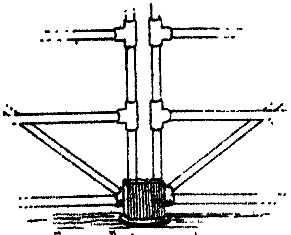
The main wheats grown are Federation for grain, and Dart's Imperial as a dual-purpose wheat. Yandilla King is also beginning to be grown; it is a heavy-yielding dual-purpose wheat. Near the railway it pays better to grow either oats or wheat for hay than for grain.

A HOME-MADE GATE "SLAM."

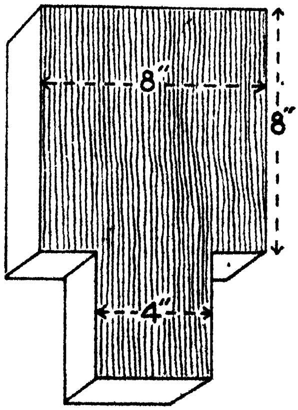
MR. ERNEST FIELD, Wave Hill Farm, Coolamon, has devised the arrangement shown in the attached sketches. The advantage of having wide gates on a farm is obvious in these days of large drills and other machinery. Single wide gates are awkward and troublesome, whereas double ones require a check in the centre of the roadway, which may interfere with the passage of machinery or injure the feet of horses. By the method shown, the block can be taken out of the way whenever it is necessary to open both gates. The sketches explain themselves.



Inserted in the ground level with the surface.



"Slam" in position.



Block to fit hole.

Insects Infesting Woollen Tops.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

An interesting communication was received from the Commercial Commissioner in the East (Mr. J. B. Suttor), together with a package of woollen tops that had been shipped from woollen mills in New South Wales, but when opened out in Japan was found to be infested with some unknown insect larvæ and pupæ that had made cocoons all over the surface of the bundles in the prepared wool. Mr. Suttor pointed out that this was a very important matter requiring investigation. No one in Japan knew anything about the insects, or how the tops became infested, and it meant a very serious blow to an important industry if the New South Wales wool arrived in the Japanese mills in such a state, because all these cocoons had to be removed before the material could be manufactured into woollen goods.

On examination of the tops submitted, I found that the closely felted cocoons in the wool contained dead pupæ and beetles of a well known preserved foods pest, the Red-legged Ham Beetle (*Necrobia rufipes*), a cosmopolitan species of the carnivorous *Cleridæ*, that feeds upon skins, bones, and preserved animal foods, such as ham, dried meats, &c. In the Islands it is known as the "Copra Bug," because it feeds upon the dry cocoanut kernels, and swarms all over any ships carrying copra.

I visited the mills from which the tops were sent, and saw the method of packing for export. Each pair of spools are folded up in brown paper; then these are packed in a jute wool pack in rows, the pack being lined inside with oiled paper, folded over the whole. The bale is then placed in a press and sewn up, so that the tops are very securely and neatly packed for export. I also visited that part of the premises where the sheepskins were stored, but failed to find any beetles in the buildings.

Mr. Suttor reported that the wrappers on the woollen tops were perforated, and as all the cocoons in the wool were found to contain dead insects which had never emerged, it is quite evident that these insects must have worked in from outside, and no blame could be attached to the exporters for the bad condition of the tops on arrival.

It is therefore quite evident that these insects, which must have been very abundant in some material in which they had developed up to the full-grown pupæ, had simply come into the wool to find a place in which to go through their development to perfect beetles. If the ships in which the bales of tops are sent carry consignments of skins, bones, or copra in the same hold, it is almost certain that it is on the ship that these tops are infested by the beetle larvæ.

Just after my report upon the matter, the Fourth Number of the Sixth Volume of the Journal of Economic Biology came to hand from London, in which there is an article by Mr. J. Mangan entitled "The Occurrence of *Necrobia* and *Dermestes* in Cotton Bales." In this paper the author gives an account of an exactly similar infestation of bales of cotton sent from Egypt to Belfast, which were "affected in this manner to a depth of 6 or 8 inches from the covering. From the carnivorous habits of this species, and from the absence of all but mature larvæ, it was obvious that the insects were not feeding upon and multiplying within the cotton, but that they had merely invaded it for the purpose of pupation."

It was found that the vessel carrying this cotton, which was shipped at Alexandria, also had a cargo of skins, rags, bones, and dried blood, from any of which these beetles could have come into the cotton.

EFFECT OF SUPERPHOSPHATE UPON DRY GRAIN.

FARMERS who have to sow wheat in dry seed-beds will be interested in the results of some experiments made by Professor A. J. Ewart, and reported in the Victorian *Journal of Agriculture* for April, 1912. Dry wheat was stored with an equal quantity of dry superphosphate for three to six weeks, and the germination was then tested. It was found that storage for three weeks did not result in any reduction in the percentage of germination over that of wheat stored without manure, and that six weeks' storage with superphosphate only reduced the percentage from 91 to 87. "Evidently," says Professor Ewart, "when the grain and superphosphate are dry, little or no injurious effect is exercised in a moderate length of time."

CONTAGIOUS ABORTION AND MILK.

CIRCULAR No. 198 of the Bureau of Animal Industry, United States Department of Agriculture, reports the discovery that the bacterium of contagious abortion of cattle occurs in milk. The organism was found in 8 samples of market milk among 77 samples tested (over 11 per cent.), and in the milk distributed by 6 among 31 dairies (over 19 per cent.). The discovery was made as the result of investigations conducted by Dr. John R. Mohler, chief of the Pathological Division. When milk containing the organisms was injected into guinea-pigs, it produced lesions resembling closely those of tuberculosis. The effect on human beings is not known, but the circular states that the phenomenon is ominously serious to public health, and that "the bacillus forms another link in the long chain of facts that point unmistakably to the proper pasteurisation of all milk before it is used as food as a measure essentially necessary for the protection of the public health."

Clarification and Purification of Drinking-water.

CHAS. J. WOOLLETT, M.R. San. Inst. (London), Inspector of Stock, Cobar.

WATER may be unsafe to drink from the excessive amount of matter in suspension—dissolved organic matter—or the presence of pathogenic micro-organisms.

Unfortunately, several portions of the State are now in the throes of a drought, and then the quality of the water supply becomes a matter of some concern. These few notes are not intended for the benefit of those in a town where there is a good potable supply, but mainly for the farmer and pastoralist unfortunately not possessing a good permanent supply of water.

During droughts the domestic supplies often have to be obtained from tanks used by stock. The water becomes very much polluted, and more or less unwholesome and unpalatable. At such times it is the misfortune of not a few to be obliged to drink water from a tank in which stock are bogged and even dead, and from which the water has a decidedly bad smell. Even in ordinary seasons, rivers become polluted through various agencies, but particularly dredging; and anyone who has resided at Wagga, for example, knows to what extent the Murrumbidgee becomes polluted.

Many persons have a very mistaken idea that clear sparkling water is always pure and wholesome, and never hesitate to drink it freely; but the slightest sign of turbidity causes suspicion. Water contaminated with sewage containing bacilli of typhoid fever, may be, withal, clear and sparkling, and yet the use of it unless purified would imperil the life of the drinker.

The most satisfactory method of clarifying and purifying water for domestic purposes is by boiling and filtering. However, boiling the drinking-water for a household is tedious, and very few will carry it on for any time, even during a "typhoid scare."

Filtration, if effective, is very slow. The most satisfactory filters on the market can only be used when there is a sufficient pressure of water; they are expensive, and they require a great deal of attention.

Stone filters, where charcoal or carbon is used, are misnamed. They may clarify water, but never purify it, inasmuch as charcoal is a suitable medium for the development of bacteria, and if water has a small bacterial count when poured into them it will certainly be more impure bacteriologically when drawn off for use than previous to the filtration. Yet they are found in many homes. The most appropriate place for these filters is in the grit-box of the poultry yard.

Muddy Water.

Water containing mud in suspension is easily clarified by dropping hot wood ashes into it, or by the application of lime or alum. These two latter substances make the water hard.

Dr. A. C. H. Rothera, of Melbourne University, has conducted some very interesting experiments in the clarification of muddy water, the results being recorded in the Victorian *Journal of Agriculture*. The tests with the chemical precipitants, alum, lime, and chloride of iron (ferric chloride), turned out in favour of the iron. The lime is only able to compete on account of its cheapness. In choosing between alum and chloride of iron, the price is at first sight in favour of the former; but, weight for weight, 1 lb. of chloride of iron is worth 2 lb. of alum. Chloride of iron is quite harmless, and a valuable mineral constituent for all animals. Medical men prescribe iron in one of its several forms as a tonic. It was found that 1 lb. of chloride of iron clarified 1,000 to 2,500 gallons of muddy water. The water was also much reduced in its bacterial contents. In a Sydney wholesale druggist's catalogue, chloride of iron is 2d. per lb.

Water with a Bad Smell.

Water that has been contaminated by organic matter, as evidenced by the smell, should, if at all possible, be avoided. However, if its use is compulsory, something must be done to purify it. Boiling, although failing to destroy the smell and the soluble organic matter, will kill any harmful bacteria.

Dissolved organic matter may set up serious intestinal trouble; but this can be guarded against by the oxidation of the organic matter by the use of Condy's crystals (permanganate of potash and soda). This substance is a deodorant and disinfectant. The crystals are added and the water stirred until a permanent faint red tinge is produced. Water would then be tolerably safe to drink.

Chloride of Lime.

Dr. G. G. Nasmith, Director of the Health Laboratories of the City of Toronto, Canada, and Dr. R. R. Graham, Assistant Chemist, have recently published a paper in the Journal of the Royal Army Medical Corps on a simple method of purifying almost any infected water supply for drinking purposes. The experiments are so interesting and instructive that I take the liberty of quoting the paper extensively in the hope that it may be useful to, among others, members of many municipal and shire councils in the State:—

> Two years ago the first system for continuously purifying a municipal water supply by means of chlorine in the form of calcium hypochlorite (chloride of lime) was installed in the United States, the amount of available chlorine being 0·3 parts per million parts of water. The success of this method for one year has established its efficacy, and similar plants are now being installed at various other places. The method is so cheap, so efficient, and the agent used so harmless that there would seem to be a great field for its usefulness in this and other countries. We have shown that 0·3 parts of chlorine in a million parts of water, or, roughly, *one pound of chloride of lime to a million pounds of water* (500 *tons or* 100,000 *gallons*) *will not only destroy typhoid and colon bacilli, but practically all bacteria in water except a few spore-formers.*

It is a valuable means of sterilising water, because chloride of lime may be bought almost anywhere, is very cheap in the infinitesimal quantity used, is not only absolutely harmless, but leaves no taste in the water, and with a few directions may be used by anyone to render an infected water safe for drinking purposes.

The writers have worked out a simple method which can be used by miners, prospectors, or campers, to purify immediately and on the spot any water which may be dangerous to drink. For armies in the field such a method will prove invaluable, for every soldier could easily carry a couple of ounces of the chloride of lime and sterilise his own drinking-water ; hence the experience with enteric fever in South Africa need never be repeated.

The method is as follows :--

(1) Take a teaspoonful of chloride of lime, containing about one-third available chlorine, and remove the excess of powder by rolling a pencil or other round object along the top of the spoon, or by flattening it with a penknife blade, so that the excess will be squeezed off.

(2) Dissolve the teaspoonful of chloride of lime in a cupful of water, making sure that all lumps are thoroughly broken up, and to it in any convenient receptacle add three more cupfuls of water.

(3) Stir up the mixture, allow to stand for a few seconds in order to let any particles settle (this stock solution, if kept in a tightly stoppered bottle, may be used for four or five days), and add one teaspoonful of this milky stock solution to two gallons of the water to be purified in a pail or other receptacle. Stir thoroughly in order that the weak chlorine solution will come into contact with all the bacteria, and allow to stand for ten minutes. This will give approximately one-half of free chlorine to a million parts of water, and will effectually destroy all typhoid and colon bacilli or other dysentery-producing bacilli in the water. The water will be without taste or odour, and the trace of free chlorine added rapidly disappears.

The writers have followed this procedure repeatedly, using only the simple apparatus mentioned, consisting of a teaspoon, a cup, and a 2-gallon pail. The water in the pail has been inoculated with typhoid and colon bacilli and examined before and after chlorination. The result was invariably the same—namely, that all typhoid and colon bacilli were destroyed.

We feel confident, therefore, that if the directions outlined are closely followed there will be a sufficient quantity of chlorine added to destroy practically all bacteria without adding any foreign flavour to the water. If the taste is present, the amount of stock solution added may be reduced until the taste just disappears without destroying the germicidal action of the chlorine.

Precautions to be observed :

Chloride of lime deteriorates rapidly when kept in cardboard packets or exposed to air. If fresh from the factory, it should contain about one-third available chlorine. Of six pound packages obtained at random from three shops, three were found of high strength, although the others would be suitable if more of the stock solution were used.

If the weak variety only is obtainable, then one and a half teaspoonfuls of the stock solution should be added to two gallons of water instead of one teaspoonful.

If the chloride of lime powder be kept in a tightly stoppered bottle, it will retain its strength for a long period. The prospector would only need to carry two small bottles—one for the powder and one for the stock solution.

It is very important that the stock solution should be thoroughly mixed with the water to be purified in order that no bacteria may escape the chlorine. The chlorine will not enter lumps or particles of organic matter, so that, if such material, or salt or mud, be present, it should be strained off or allowed to settle, and the clear water used for sterilising.

Water containing hydrogen sulphide must be given larger quantities of chlorine solution.

Chloride of lime is quoted in a Sydney wholesale druggist's catalague at 16s. per cwt. in Sydney; in ½ lb. bottles, well corked and sealed, 4d.; in 28 lb. tins, 6s.

Improvement of Dairy Herds.

RESULTS AT HAWKESBURY AGRICULTURAL COLLEGE.

M. A. O'CALLAGHAN.

THE value of herd-testing is illustrated in the records of the 1911 milk yields for the Hawkesbury Agricultural College dairy herd, which are now available. The herd has been steadily improved since 1898 by the use of imported purebred bulls, or of bulls descended from imported stock. In this way it has been graded up until it has reached a highly satisfactory standard, especially when it is recollected that fifteen years ago the herd was only yielding an average of about 3,000 lb. of milk per cow per annum, and when also the class of country is taken into account.

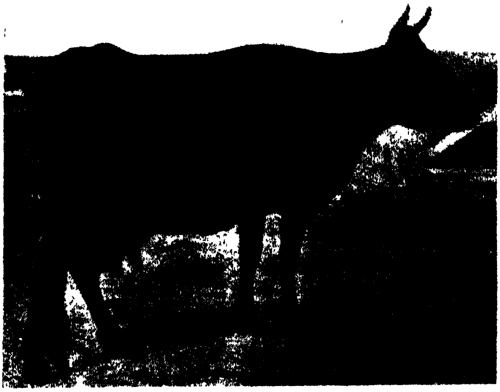


Fig. 1.—Type of Grade Kerry in College herd.

High Averages.

The records of the milk and butter yield from each cow during one period of lactation in 1911 shows that the herd of sixty-three cows averaged 5,395 lb. of milk per head, and 251·2 lb. of butter. Taking the value of the butter as 10d. per lb., the average value of the butter produced was £10 9s. 4d. per cow.

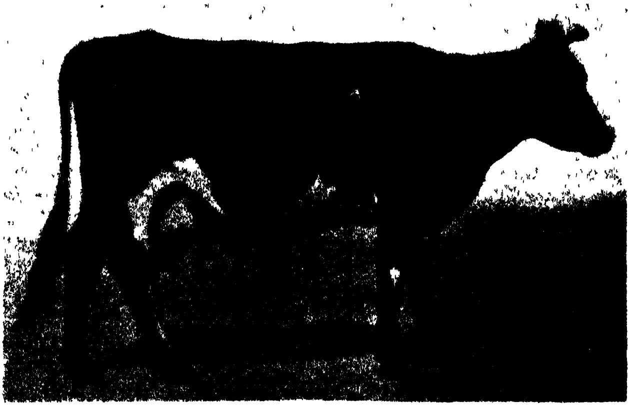


Fig. 2.—Grade Holstein Type.

The first three cows on the list produced, respectively, butter worth £19 5s. 6d., £15 17s. 1d., and £14 18s. 2d., or an average of £16 10s. 3d. The last three on the list gave, respectively, £5 3s. 8d., £4 8s. 8d., and £4 6s. 2d. —an indication that even in a good herd there are those that fall a good way below the average. The produce of the first few cows, in weight, was as follows:—Jersey-Kerry-Jersey—9,364 lb. milk, 462 lb. butter; Kerry-Jersey—7,896 lb. milk, 380 lb. butter; Shorthorn Jersey—7,360 lb. milk, 345 lb. butter; Holstein—7,911 lb. milk, 333 lb. butter; Ayrshire—7,552 lb. milk, 327 lb. butter.

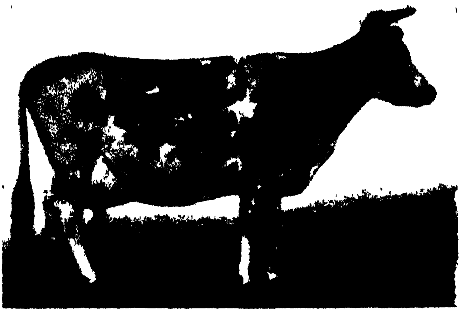


Fig. 3.—Type of pure old Ayrshire in College herd.

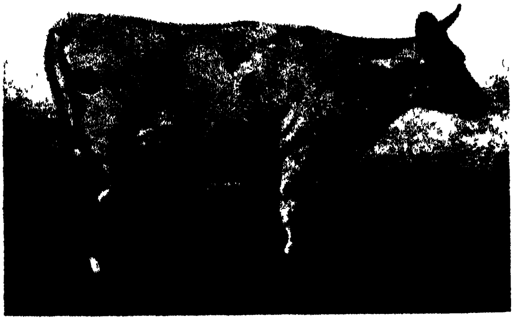


Fig. 4.—Type of Ayrshire Heifer in College herd.

Fig. 5.—Type of Grade Guernsey in herd.

Butter Breeds that do well.

This is a good average for such a numerous herd, especially as it contains a large percentage of heifers on their first calves. The value of butter breeds like the Jersey and Kerry, on light land such as that forming the greater part of the College lands, is demonstrated by the fact that the first ten include four animals of the Kerry-Jersey cross. The milk is weighed night and morning at the College, and is tested for butter-fat at regular periods, the records being carefully kept and furnishing interesting comparisons with the yields of years ago. Most of the animals now milked have been bred on the farm, and the averages show a vast improvement on past records.

Latterly, a pure Ayrshire herd has been founded. A number of the Ayrshires have been transferred from Berry Stud Farm to be mated with the imported Ayrshire bull that was selected for the Department by Mr. Dunlop, one of the Scottish Commissioners.

HAWKESBURY AGRICULTURAL COLLEGE.

Milk and butter yields during one period of lactation, 1911.

Order of Merit.	Breed.	Distinguishing Number	Calving Period.	Total Milk.	Average Fat Test.	Total Butter.
				lb.	per cent.	lb.
1	Jersey-Kerry-Jersey	56	6	9 364	4·2	462·6
2	Kerry-Jersey ...	42	4	7,896	4·1	380·5
3	Shorthorn-Jersey	14	1	7,360	4 0	345·8
4	Holstein	29	2	7,911	3 6	333·6
5	Ayrshire	64	7	7,552	3·7	327 6
6	Shorthorn grade...	63	4	7,122	3·9	326·1
7	Holstein-Ayrshire	47	1	7,081	3·9	324·2
8	Kerry-Jersey ..	10	5	7,270	3·8	324·
9	Holstein-Ayrshire	20	2	6,455	4·2	318·9
10	Kerry-Jersey ..	19	6	6,430	4·2	317·6
11	Ayrshire	145	7	7,502	3·6	316·4
12	Kerry-Jersey	75	6	6,545	4·0	307·5
13	Dexter Kerry-Shorthorn	141	6	6,670	3·9	305·5
14	Ayrshire	61	6	6,824	3·8	304·2
15	Ayrshire ...	94	7	6 350	4 0	298·4
16	Holstein-Ayrshire ..	40	2	6,488	3·9	297·
17	Shorthorn-Ayrshire	62	3	6,602	3·8	294·3
18	Jersey-Ayrshire ..	35	8	6,237	4 0	293·1
19	Ayrshire grade ..	25	2	6,329	3·9	289·8
20	Ayrshire	1	7	6,308	3 9	288·8
21	Jersey	22	4	5,800	4·2	286·5
22	Holstein-Ayrshire	82	2	6,418	3·8	286·1
23	Holstein-Ayrshire	17	2	6,595	3·7	286·
24	Shorthorn-Ayrshire	70	6	6,171	3·9	282·5
25	Ayrshire	6	4	5,990	4·0	281·5
26	Ayrshire-Holstein	30	2	6,297	3·8	280·7
27	Holstein-Ayrshire	9	2	6,258	3·8	279·
28	Guernsey...	51	3	5,131	4·6	278·2
29	Holstein-Ayrshire	26	2	6,588	3·6	277·8
30	Ayrshire	60	2	5,812	4·0	273·1
31	Holstein-Ayrshire	11	2	6,229	3·7	270·2
32	Ayrshire	13	5	5,813	3·9	266·2

Milk and Butter Yields, &c.—*continued.*

Order of Merit.	Breed.	Distinguishing Number.	Calving Period.	Total Milk.	Average Fat Test.	Total Butter.
				lb.	per cent.	lb.
33	Kerry-Jersey ..	7	6	5,614	4·0	263·8
34	Ayrshire .. .	96	3	5,439	3·9	249·
35	Kerry-Jersey	41	5	5,096	4·1	245·8
36	Ayrshire .	88	4	5,352	3·9	245·
37	Ayrshire .. .	32	5	5,579	3·7	242·
38	Guernsey	52	3	4,665	4·4	241·7
39	Kerry	203	2	4,577	4·4	237·1
40	Ayrshire	163	3	5,302	3·7	230·
41	Holstein-Ayrshire	21	2	5,117	3 8	228·1
42	Kerry-Jersey ..	165	1	4,914	3·9	225·
43	Ayrshire grade .	143	3	4,518	4·2	223·2
44	Holstein-Ayrshire	34	2	5,031	3·7	218·2
45	Dexter-Kerry . .	D 5	3	4,213	4·3	213 2
46	Ayrshire . .	50	3	4,300	4·1	207·2
47	Shorthorn-Ayrshire	65	1	4,459	3·8	198·8
48	Dexter-Kerry	D 7	3	3,740	4·5	198·3
49	Ayrshire grade .	24	3	4,210	3·9	192·8
50	Kerry .	204	1	3,612	4 5	191·5
51	Ayrshire-Jersey .	16	3	3,931	4·1	189·4
52	Kerry	202 (106)	1	3 507	4·4	181·7
53	Holstein-Ayrshire	54	2	3,925	3·8	175·
54	Kerry .	200	1	3,318	4·3	167·9
55	Shorthorn-Ayrshire	190	1	3,619	3·8	161·3
56	Ayrshire grade	185	1	3,285	4 1	158·3
57	Kerry .	208	1	2,947	4·5	156·2
58	Kerry .	205	1	2,990	4·3	151·3
59	Dexter-Kerry .	D 4	3	2,916	4·4	151·1
60	Shorthorn grade	4	1	3,277	3 8	146·1
61	Ayrshire grade	176	1	2,648	4·0	124·4
62	Ayrshire-Red Poll	178	1	2,208	4·1	106·4
63	Ayrshire	160	1	2,200	4·0	103·4

These results may be briefly summarised thus —

	No	Milk		Butter		
		Total Quantity	Average per head	Total Quantity	Average per head.	Valued at 10d. per lb net
		lb	lb.	lb.	lb.	£ s d.
Whole herd	63	339,907	5,395	15,826 9	251·2	10 9 4

	£	s.	d.
Value of top cow's butter	19	5	6
,, 2nd ,, .	15	17	1
,, 3rd ,, .	14	8	2
Average of the three .	£16	10	3
Value of 3rd last cow's butter	5	3	8
,, 2nd ,, ,, .	4	8	8
,, last cow's butter	4	6	2
Average of the three .	£4	12	10

The record to the cows of the Kerry-Jersey cross is rather an extraordinary one. There were eight animals of the Kerry-Jersey strain of blood in the herd, and they averaged 315 lb. of butter for the lactation period.

Quite a large percentage of the animals recorded here are heifers, and hence the record is a better one when analysed closely than actually appears at first sight. In addition, there are a number of pure-bred Kerries included in the record that were brought up on the Glen Innes Farm during a season of drought, and became stunted in growth, and they have never thoroughly recovered from the effects of this.

In calculating the amount of butter per head, it has been assumed that such butter should contain a minimum of 83 per cent. of butter fat. An average loss has also been allowed for the amount of fat lost in separating.

EXCESSIVE PRODUCTION AND BREEDING POWER.

On a number of occasions, such as in the *Gazette* for February last, page 94, I have drawn attention to the wrongfulness of stimulating stud cows for record purposes. When a cow has reached a certain standard on her third calf, no effort to get high butter records should be made if she is to be utilised for stud purposes.

Mr. Frank Le Patourel, of the Minnesota Experiment Station, has worked out a very interesting calculation from the 1,208 cows of the Guernsey breed which have qualified in the Advanced Registry, to show the effect of excessive production of butter-fat on the power to breed. He finds that of the cows giving the high yield of 650 lb. butter-fat and over, 21 per cent. were not two months in calf. "It seems almost incredible," says Mr. Le Patourel, "that 21 per cent., or one out of five cows, are not safely in calf while making an exceptional record." Commenting on the report, "Hoard's Dairyman" says:—

> There has been an abundance of proof in all the dairy breeds that crowding cows to make high records is a disastrous course to their power to breed, and in many instances has resulted in very serious derangements. It is a good thing to take cows through the Advanced Registry, but this should be done for the purpose of determining the natural, not forced, ability of the cow to produce milk and butter-fat. Such knowledge is valuable to the breeder, for he then knows clearly which are his best cows and which are the most promising to select bulls from, for it is the mother that makes the bull. If, however, the mother has been crowded unduly, her breeding power has been impaired and often totally destroyed. We have often thought that the best bull to select would be one that was born from a phenomenal cow before her record was made.

ERRATUM.

On page 329 of April *Gazette*, it was stated that the best record of the imported Jersey cow Calceolaria was 5,841 lb. of milk, which produced 247 lb. of butter. The latter figure was a clerical error, the butter yield being 347 lb.

Water in Butter.

INVESTIGATIONS WITH COMBINED CHURNS.

UNDER instructions from the Dairy Expert of the Department, experiments are being conducted at various butter factories by the Dairy Instructors to obtain further information as to the causes which produce an excessive percentage of water in butter under various conditions. The factory managers are co-operating with the Department in the matter, and it is hoped that information of much value to the dairying industry will be obtained in this way.

The following are the points upon which the Instructors are required to note observations:—

1. The age of the cream.
2. The acidity.
3. The temperature at which it was churned.
4. The temperature of the wash-water.
5. The stage at which the first water was added.
6. The method of working the butter, and whether it was worked once or twice.

The following notes by Mr. MacInnes show the results of observations made at one North Coast factory during November and December of last year. In this case, unsalted butter was being made, and combined churns and butter-workers were being used. Other reports will be published in due course.

SOME DATA ON THE MOISTURE PERCENTAGE IN UNSALTED BUTTER.

L. T. MACINNES, Butter-grader and Dairy Instructor.

Early in November, 1911, the water in the unsalted butter made by a North Coast factory rose to 16 per cent. despite the efforts of those interested to control and keep it down. At this factory combined churns and butter-workers are used. Previous to the date mentioned, the moisture contents had been much lower, and within the limit prescribed by the Commerce Act Regulations, viz., 15 per cent.

I first graded and examined unsalted butter at this factory on 23rd September. The cream from which it was made was churned at a temperature of 50 to 52 degrees Fah , and with an acidity of ·60. By evaporation over a spirit lamp, the butter was found to contain 14 per cent. of water. During October, with cream at 50 to 52 degrees, and acidity ·55, the moisture rose to 14·5, 14·7, and 14·8 per cent., and on 4th November to 16 per cent., from cream churned at 50 degrees Fah., with acidity 53. The temperature of the water used for washing the butter in the churns ranged from 40 to 43 degrees Fah. From that date I have noted particulars in connection with the manufacture of unsalted butter.

On 11th November, churning commenced at 6 a.m. The temperature of the cream was 50 degrees, and that of the water 42 degrees. The acidity of the cream was ·56 for the first churn, and ·58 for the last. The butter was tested for water throughout the day's operations, and the results were 15·1, 14·9, 14·8, 14·6, and 14·5 per cent.—the moisture decreasing and the acidity increasing as the day wore on.

An accurate record was kept on this and succeeding occasions when unsalted butter was made, of the temperature of the cream, water, butter, &c.; acidity of cream; length of time to churn; number of revolutions of churn to complete the first working; time in chilling-room between first and second workings, and time given for second working. The same butter was analysed, first on the completion of the first working; and again at the end of the second (when it was ready to pack), so as to determine how much water was expelled in the second working. The smallness of this quantity is explained by the closeness of the grain and compactness of unsalted butters. With salted, on the other hand, the grain is more open, and the action of the salt gathers the water into large beads, which are easily expelled as the butter passes under the rollers of the "workers."

On 11th November, the length of time given to the first working was also experimented with, taking a sample for analysis immediately the butter was emptied from the churn. This butter was marked and followed to the completion of the second working, when further samples were tested for water, as follow:—

	Moisture percentage.	
	First Working.	Second Working.
Five revolutions	15·1	14·8
Six ,,	15·3	15·0
Seven ,,	15·4	15·3

The difference in water percentage between five revolutions and seven is seen to be 0·3 on the first and 0·5 on the second working, that made with the smaller number of revolutions containing the least moisture.

These lots were churned simultaneously, the cream being taken equally from the same vats, and the acidity of each was ·56. Later on in the day, the acidity having risen to ·58 (other conditions being unchanged), the moisture was found to have fallen to 14·6 and 14·5 per cent.

On all future occasions five revolutions were given for the first working, this number having been found to give the best results. Going beyond that limit, the water which remained in the churn was worked into the butter instead of being expelled.

At the end of the first, second, and third revolutions the churns were checked when the doors were undermost, and the water allowed to drain off. For the remaining two turns they were allowed to run on without a stop, and at the end of the fifth the butter was emptied out and taken away to the chilling-room to await the second working.

The following are the tabulated records of the various days' churnings. Those up to November are obtained from the factory's logs; and although they do not go into as much detail as those I am now keeping, yet they cover the main essentials and enable a valuable comparison to be made.

I am greatly indebted to the manager and head butter-maker for the assistance and information afforded me on all occasions.

Date.	Temperatures. Fahr.		Acidity of Cream.	Percentage of water in butter when packed	Acidity of Cream.	Percentage of water in butter when packed.
	Cream.	Water.				
1911.	° °	° °				
September ...	50–52	40–42	·60	14·2, 14·0, 13·9	·53	16·0.
October ..	50–52	40–42	·55	14·8, 14·7, 14·5	·55	14·8, 14·7, *14·5½.
November ..	50–52	40–42	·53	16·0.	·56	14·8.
,, ...	50–52	40–42	·56	14·8.	·58	14·6, 14·5.
,, ...	50–52	40–42	·58	14·6, 14·5.	·60	14·2, 14·2, 14·0, 14·0, 13·9.
,, ..	50–52	40–42	·60	14·2, 14·0	·62	14·2, 14·0, 13·8.
December ..	50–52	40–42	·62	14·2, 14·0, 13·8.	·63	13·8.
,, ...	50–52	40–42	·63	13·8	·64	13·3, 13·0.
,, .	49–51	40–42	·64	13·3, 13·0.	·66	14·7 (one churn only).
,, ..	48	41	·66	14·7		

* Last churn acidity, ·57

The acidity shown above was taken at the commencement of churning. By the time the last churn was filled it had risen slightly—about ·01 to ·02.

From these records it will be seen that the best results were obtained from cream churned at a temperature of 49 degrees F., with an acidity of ·64. But, taking the temperature of the cream apart, on 28th October, 4th, 11th, and 28th November, and 9th December, the temperature was 50 degrees in each case, while the moisture ranged from 16 down to 13·8 per cent.; and again on 2nd and 9th December the temperatures were 51 degrees, while the water content was 13·3 and 13 per cent. respectively. As regards the lot churned on 16th December at 48 degrees, I will make no comment until such time as I am able to compare the results of cream of similar acidity churned at temperatures varying from 48 to 52 degrees, and at the same time check the amount of water used in breaking down the cream, or what is technically termed "bringing in the butter." Until this can be done, the data as regards the acidity results are inconclusive.

If the temperature of the cream churned had been high—say, 56 or 58 degrees—we would naturally expect the moisture to have been increased considerably; but with the temperatures regulated down to about 50 degrees always, and acidity ranging from ·53 to ·64 (with the exception of the single churning already mentioned, 16th December), the moisture content always varied inversely with the amount of acid in the cream. That is, a low acidity cream (·53) churned butter giving 16 per cent. of water, while a much higher acid test (·64) resulted in a reduced water content of 13 per cent.

NOTE: The weather conditions are only valuable in giving some idea of the state of the pastures, and the information is not complete, so it is omitted for the present.—M. A. O'CALLAGHAN.

LUCERNE AND THE DROUGHT.

THE following are a few extracts from the series, "Lessons of the Drought," which appeared in the *Gazette* after the great drought of 1902:—

Grafton District: The fodder crop which grows best in the district is undoubtedly lucerne. Although many lucerne crops were apparently done for during the drought, when the rains came they responded at once.—CHAS. W. SABINE, Inspector of Stock.

Of all crops, lucerne showed out best.—J. A. BULKELEY, Manager, Grafton Experiment Farm.

South Coast: In this great district one is struck very forcibly by the conspicuous absence of the king of fodders—lucerne Stacks should be a striking feature on the coast.—P. QUIRK, Manager, Berry Stud Farm.

New England: Lucerne appears to be the most useful of the fodder plants.—R. H. GENNYS, Manager, Glen Innes Experiment Farm.

The artificial grasses which stood the effect of the drought best were perennial rye and lucerne.—J. B. WISDOM, Inspector of Conditional Purchases.

Murrurundi: In my districts, Murrurundi and Denman, lucerne, especially in old-established beds, was by far the best drought-resisting crop.—C. BROOKS, Inspector of Stock.

Mudgee: Lucerne was the only crop that withstood the drought in this district.—C. J. CROCKER, Inspector of Stock.

Wagga: Of exotic plants on the farm, the most responsive to showers during and after the drought were sheep's burnet and lucerne.—G. M. MCKEOWN, Manager, Wagga Experiment Farm.

Corowa: Lucerne is the only artificial fodder grown in the district, and after the December rains, at the end of the drought, proved of great value.—ALEX. CAMPBELL, Inspector of Stock.

Bathurst: Of all grasses sown in this district, lucerne is acknowledged to be the best when on suitable land.—G. SYDNEY SMITH, Inspector of Stock.

Maitland: In all parts of this district, lucerne, whether irrigated or not, resisted the drought best.—M. BARLOW, Surveyor.

Deniliquin and Wentworth districts were the only ones from which reports unfavourable to lucerne were received, and in both cases the comment was merely that irrigation is required.

THE KERRY FOR DRY SEASONS.

IN "Lessons of the Drought," *Gazette* December, 1903, page 1160, Mr. P. Quirk, Manager of Berry Stud Farm, wrote:—

> Having eight distinct breeds on the farm, we had a fair object lesson as to the merits and demerits of the different breeds. As for hardiness, I must say Kerries are wonderful, being able to withstand all weathers, shift for themselves, while giving large quantities of milk. A Kerry, Belvedere Bratha 3rd, yielded 48 lb. of milk per day, testing 4·2 per cent. fat, in the worst of the drought. . . . . Dexter Kerries need no comment, as they will live in the back yard.

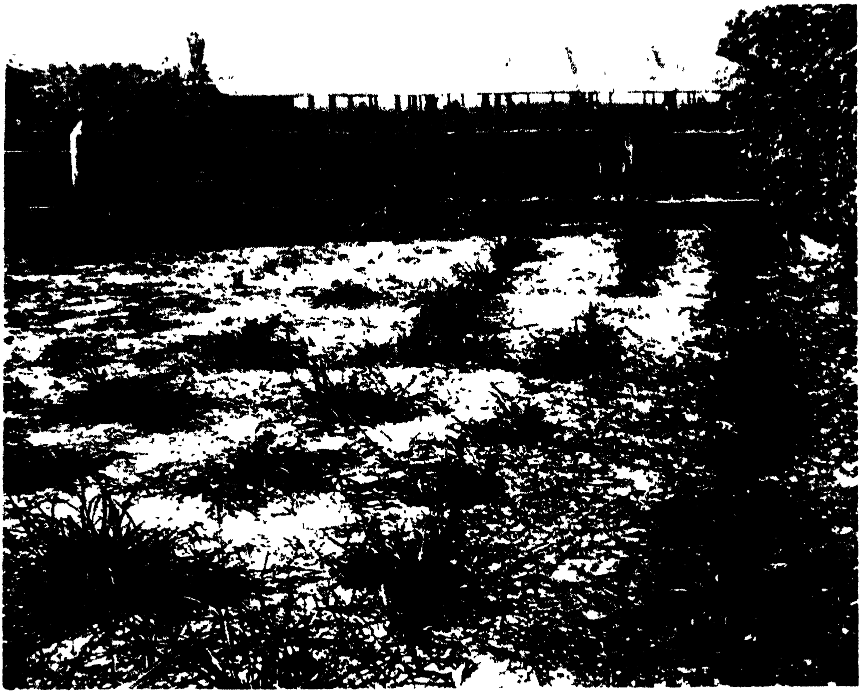


Fig. 1. Rhodes Grass at the Piggery, 40 days after planting

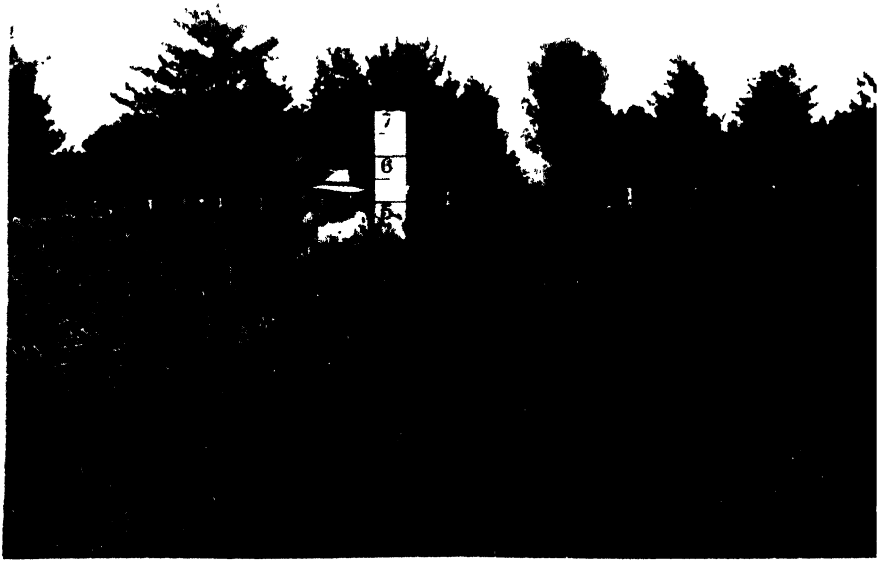


Fig. 2. Rhodes Grass ready to cut for Hay.

RHODES GRASS AT HAWKESBURY AGRICULTURAL COLLEGE

Rhodes Grass at the Hawkesbury Agricultural College.

J. W. HADFIELD, Instructor in Agriculture.

PHOTOGRAPHS in the present issue of the *Gazette* show Rhodes grass growing under various conditions at the College. It might be of interest if some account were given of the methods adopted here in growing this grass and the results that have been attained.

A very sandy and badly drained portion of the orchard was last year fenced off as being altogether unprofitable. The trees were grubbed out, and the area—1 acre in extent—ploughed in readiness to sow a grass mixture. Twelve hundredweight of manure was applied, consisting of 8 cwt. of abattoir manure and 4 cwt. of sweepings from the manure shed. On 18th August, 1911, the grass mixture was sown with a barrow and box grass-seeder at the rate of 15 lb. per acre, made up of equal quantities of Rhodes, Paspalum, and Lucerne.

Fig. 3.—Making Rhodes Grass Hay. Yield, 2½ tons per acre.

Very little was anticipated from the beginning, owing to the poverty of the soil. Spurrey (*Spergula arvensis*) covered the ground and appeared to be taking possession altogether. By January, however, there was a heavy stand of Rhodes grass, with here and there a little lucerne, but not a sign of Paspalum. The heavy dressing of nitrogenous manure was in all probability indirectly responsible for the relatively small quantity of lucerne and increased the percentage of grass to a degree that was almost detrimental to the crop as a pasture.

On 11th March, 1912, it was cut with a mower, both with the idea of testing its palatability as hay and in an endeavour to make a turf, rather than allow it to become tussocky. Two and a half tons of hay were taken off the acre, but the results of feeding it to stock were rather disappointing. At present there is an abundance of grass at the College, and in every case the stock turned away from the Rhodes, preferring their usual pasture or chaff, as the case might be.

The hay has a very marked and somewhat offensive smell, which may detrimentally affect its palatability when fed for the first time. The stock will certainly eat it while green, and, no doubt, with hunger as an appetiser, they would also eat the hay readily enough. Further trails will be conducted as opportunity offers, and an endeavour made to settle this very important point. In the meantime we have favourable reports from many parts of the State upholding the reputation of this grass.

At the College piggery Rhodes grass has been grown for three or four years. It has spread well in the paddocks and yields good green feed during the summer, when such material is most in demand. An endeavour has lately been made to establish it in the yards. The roots are planted out 2 feet each way, and it spreads over the ground by means of runners, and also by re-seeding.

The danger of grazing pigs on this grass is that, although they relish the tops, their natural tendency is to root the grass out of the ground, and hence on these small areas it is advisable to cut it once or twice with the scythe, thus enabling the grass to obtain a sufficiently good hold, so that the pigs will not materially damage the stand.

The photographs illustrate the grass at different stages of its development. They were taken on 12th March. The yard represented in Fig. 1 had only had forty days' growth, and had been lightly grazed once.

SILAGE FROM CORNSTALKS.

FARMERS whose corn crops have failed during the late dry summer and autumn are reminded of the following remarks by Mr. Chas. W. Sabine, Inspector of Stock in the Grafton district, which appeared in the *Gazette* for December, 1903, page 1157. This was portion of a series of articles entitled "Lessons of the Drought," in which field officers of the Department were placing on record, for guidance in the event of future droughts, data as to the means which proved most effective in mitigating the effects of the series of dry seasons ending with the drought of 1902 :—

> During the drought last year the early corn crops, which up to Christmas promised to give record yields, were a complete failure, and large quantities of cornstalks were conserved, principally as silage, which proved a great standby to stock-owners until the rains came These stacks when opened up were readily eaten by cattle, and the experience gained by stock-owners was of great benefit and profit to both themselves and the district. Dry cornstalks were used extensively; and were generally fed to stock chaffed, with the addition of either treacle or bran.

Diseases of Animals.

Compiled by the Veterinary Officers of the Stock Branch, under the authority of S. T. D. SYMONS, M.R.C.V.S., Chief Veterinary Officer.

No. 3.

OPHTHALMIA.

OPHTHALMIA may be defined as an inflammatory affection of the eyes and adjacent parts. It attacks all domesticated animals, but chiefly horses, cattle, and sheep; frequently assuming an infectious form, and spreading through a stable, herd, or flock with great rapidity. In fact, it is so often apparently infectious that it is wisest to treat every outbreak as such, and to isolate the affected animal, when practicable, at the earliest opportunity.

Certain methods of treatment which have been found to give good results, are recommended in subsequent remarks on the disease, and in each case the recommendations have been made as simple as possible, the difficulty in treating large numbers of animals being thoroughly recognised. Some readers may, however, find it impossible to apply the treatment exactly as recommended, but in such cases the alternative is to follow the lines laid down as nearly as circumstances and the environment of the animals affected will permit.

In regard to valuable horses, cattle, or stud sheep, treatment should always be persisted in, as it must be borne in mind that at the outset the disease is comparatively easily checked; whereas if neglected, it gives rise to serious trouble and great difficulty in effecting a cure: in fact recovery may only be partial, and serious after-effects will remain. Therefore, recourse to treatment in all cases as early as possible is strongly advocated.

Causes.

Hay, or grass seeds, grains of sand or dust, or other minute particles of matter gaining access to the eye. Injuries, such as blows from a whip, a branch of a tree, a rope-end, or other likely instrument. Prolonged exposure to sun-glare, cold winds, or rain, may induce the disease, or it may be introduced on to a farm through the medium of a newly-purchased animal affected with ophthalmia.

Symptoms.

At first, there is a discharge of tears from the eyes; the eyelids are swollen, tender, and wholly or partially closed, and the membrane lining them is inflamed and red in colour. The discharge from the eyes is sometimes tinged with blood, and changes in three or four days from a watery fluid to one that is thick, and whitish or yellowish in colour, often containing pus (matter), which collects in masses inside the eyelids and along their edges, and in the inner corner of the eye, gluing the eyelids and eyelashes together, and making it impossible for the animal to separate the eyelids without assistance. The haw of the eye projects more than usual, and there is marked dislike to light, the animal shrinking from any kind of light, natural or artificial.

In a good many cases, the front of the eye-ball is covered by a whitish film in which an ulcer will at times form. This ulcer may eventually eat through the front of the eye-ball, causing loss of sight in the affected eye. There is often fever and constitutional disturbance, the sick animal goes off its feed, and separates from the others, and in milking cows the amount of milk given is much decreased. One or both eyes may be affected.

Treatment.

Separate all affected animals from the healthy ones, and keep them apart. Remove any irritating body, such as grass-seed, which may have obtained entrance to the eye; this is best done with a soft, clean feather, or with a clean camel's hair brush. The patient should be kept in a cool, dark box or shed whenever possible.

Give an active purgative in all cases, such as a pint to a pint and a half of raw linseed oil for a horse, a pound of Epsom salts for a cow, and six ounces of Epsom salts for a sheep. The Epsom salts can be given dissolved in warm water, with a little ground ginger added. After the purgative has acted, give the following dose night and morning:—One ounce of hyposulphite of soda, and a quarter of an ounce of nitre, for a horse; double these quantities for cattle; and a quarter of an ounce of hyposulphite of soda, and a dram of nitre for a sheep. The medicine may be conveniently given dissolved in the animal's drinking water.

The eyes should be bathed night and morning, or, preferably, with greater frequency, for half an hour at a time, with a warm strong solution of boracic acid. The lids, when stuck together, should be gently separated, and their edges smeared with vaseline. A piece of soft white cotton or calico should be hung over the eyes with tapes, and kept constantly damp with the boracic acid solution; this will serve as a protection against light, dust, and flies.

After bathing the eyes, a little of any one of the following lotions may be applied night and morning, the mode of application being to drop the lotion into the eye by means of a glass syringe, a small sponge, or a piece of soft rag. Whichever is used, it must be absolutely clean:—

Mercuric chloride	1 grain
Distilled water	10 ounces
or	
Salicylic acid	5 grains
Distilled water	10 ounces
or	
Sulphate of zinc	30 grains
5 per cent. solution of boracic acid ...	10 ounces

If in addition to the eye-ball becoming covered with the so-called white film, an ulcer also forms, the case will be prolonged, and a variation of the treatment will be required. It will then be necessary, after all signs of inflammation have disappeared—namely, redness, swelling and tenderness of the eyelids—and the discharge from the eye has ceased, to apply a little of the following ointment night and morning:—

Yellow oxide of mercury	16 grains
Boracic acid	1 dram
Vaseline	2 ounces.

The ointment to be applied just inside the upper or lower eyelid. This treatment should be continued until the film has almost disappeared; then bathe the eye with the boracic acid solution once daily, preferably in the morning, and afterwards, instead of the ointment, apply a little of the following solution to the ulcerated part with a clean camel's hair brush:—

Nitrate of silver	6 grains
Sulphate of morphia	2 grains
Distilled water...	2 ounces.

THE "CARRION FLOWER."—A SUGGESTED REMEDY FOR SHEEP-MAGGOT FLY.

MR. F. C. JACKSON, of Sydney, recently drew the attention of the Department of Agriculture to the genus of plants known as *Stapelia*, which are natives of the arid parts of South Africa, and which bear beautiful flowers with a most disgusting odour of decaying meat. The flies blow these flowers (evidently under the impression that they are really meat), and the maggots, having little to feed upon, drop to the ground and die of starvation. Mr. Jackson suggested that the Department might import some of these plants for experiment purposes against sheep-maggot fly.

Mr. W. W. Froggatt, Government Entomologist, communicated with the South African authorities, and has now received the following reply from Mr. Chas. P. Lounsbury, Chief of the Division of Entomology, Union of South Africa:—

> The Government Botanist has replied as follows to questions suggested by your letter:—
>
> 1. *Stapelias* are natives of South Africa.
> 2. They are not likely to become pests.
> 3. They are not uncommon plants, but are not exactly plentiful.
> 4. The plants are not known to be poisonous
> 5. They can be propagated from rooted cuttings. Plants could be obtained through a nurseryman, such as Ayers, Capetown, or one of the Botanic Gardens.
>
> I would add that the flowering period is very short—about two weeks.
>
> I do not know for certain that blow-flies would be attracted to the plants, but it is probable that they would be to some extent. As a means of trapping blow-flies, however, I am inclined to consider the utilisation of these plants much as I do the proverbial way of catching birds, viz., "placing salt on their tails." As you probably know, an immense variety of *Stapelias* are natives in this country, but we have no special immunity from blow-flies that can be attributed to them.

Tobacco Crops in Northern District, 1911-12.

JOHN GILMOUR.

In April last I visited the tobacco growers in the Northern District, which includes Manilla and Upper Manilla, New Mexico, Keepit, Somerton, Tintinhull, Dungowan, Tamworth, Attunga, Wollomol, &c. All those growers who irrigated have beautiful crops, even better than last year for quantity and quality. I have never seen such fine crops of tobacco. It has been a very dry season in the north, and as a result those who could not irrigate have very little tobacco to show for their labour.

I am glad to be able also to report that they have all adopted the methods impressed upon them last year, to improve the colour of their tobacco, and as a result we shall have even better coloured leaf this year than we had last year

Notwithstanding the dry season, the crop will be much larger than last year's was, owing to so many more going in for tobacco cultivation, and those who were already in it extending their area this year. There will be from 50 to 100 tons more tobacco this year from the Northern District than last. The Tamworth and district growers have been very successful, as well as those at Somerton, Keepit, and Dungowan.

Flue-curing is also being done better this year than last, although there may not be so much cured by this method as was done last season. I have not pressed the growers in the North to go in for flue-curing yet, as they can obtain very good results by making more use of the sun, as they are now doing.

I made a special trip to Gunnedah to visit Mr. H. J. Weaver's farm, where about twenty gentlemen interested in farming, including the Mayor and Aldermen, met to hear about tobacco cultivation and its prospects in their district, with the result that in the near future we may expect to have a fair quantity of leaf from that point. I was pleased with Mr. Weaver's first attempt at tobacco-growing, and feel sure he will do better next season.

In conclusion, I have much pleasure in stating that I consider the tobacco industry in the Northern District has got a fair start. The crops last year and this, notwithstanding the dry conditions, are the largest and best ever raised there—about 500 tons—if frosts do not catch them before they are gathered. The growers are certainly all a little late in cutting this year, but my representations have induced them to hurry.

Tobacco Plantation at Wollomol, near Tamworth, Season 1912.

Exports and Cold Storage.

H. V. JACKSON.

Rabbits and Hares.

It is estimated that the quantities of rabbits and hares packed and frozen in New South Wales during the year ending 31st December, 1911, were as follow:—

RABBITS.

January to June, 1911	296,204 crates.
July to December, „	231,373 „
Total	527,577 crates.

The above number of crates equal 12,661,848 single rabbits.

HARES.

January to June, 1911	162 crates.
July to December, „	328 „
Total	490 crates.

The quantity of rabbits and hares exported were 6,806,446 pairs, valued at £330,754, being a decrease of 1,200,622 pairs, and showing a shortage in value of £76,008, in comparison with 1910.

The rabbit and hare skins exported amounted to 5,181,839 lb., value £296,678; showing a decrease in value exported of £32,938.

The value of frozen rabbits and hares, and of skins exported, totalled for 1911 the sum of £627,432, or a decrease in comparison with 1910 of £108,946.

Rabbit-packing and freezing were carried on during the winter months at works in Sydney as under:—

Birt & Co., Limited, Pyrmont.
Fresh Food and Ice Co., Limited, Darling Harbour.
Metropolitan Ice Co., Limited, Harris-street.
Sydney Ice Skating Rink and Cold Storage Co., Limited, Harris-street.
Sandown Freezing Works, Parramatta.

Work was also continued at freezing establishments in the country as follow:—

Australian Inland Freezing Co., Limited, Harden.
The Country Freezing Co., Limited, Dubbo.
„ „ „ Warrigal.
„ „ „ Blayney.
„ „ „ Young.
„ „ „ Gunnedah.
„ „ „ Canowindra.
Bungendore Freezing Co., Limited, Bungendore.

Braidwood Freezing Co., Limited, Braidwood.
Crookwell Refrigerating Co., Limited, Crookwell.
Dunedoo Refrigerating Co., Limited, Dunedoo.
Lachlan Freezing Co., Limited, Cowra.
R. Little & Co., Millthorpe.
J. Moore, Orange.
Mudgee Freezing Works, Mudgee.
Narrabri Co-operative Dairy Co., Limited, Narrabri.
G. J. Rohr, Wagga.
W. White, Tumut.
,, Cootamundra.
„ Germanton.
Wilson and Flood, Bathurst.

From the above particulars, it is seen that twenty-six different freezing works were engaged freezing rabbits during 1911. Notwithstanding that fact, however, the output was less than that of the previous year.

Poultry and Eggs.

The Interstate imports at Sydney, as compiled and obtained through the courtesy of the Harbour Trust, for the twelve months ending 31st December, 1911, were as follow:—

Eggs in shell,	894 tons (measurement);	value,	£16,134.
Live poultry,	5 ,,	,, ,,	32.
Frozen „	134 „	,, „	5,409.

EGGS HELD IN COLD STORAGE.

It is estimated that over 15,677 cases of eggs in shell were held in the cool stores during the season 1911–12.

The following are the figures for the past fourteen years:—

1898	...	11,000 dozen.	1905–6	...	288,648 dozen.
1899	...	93,000 ,,	1906-7	...	150,322 ,,
1900	...	96,000 ,,	1907–8	...	250,000 ,,
1901	...	140,292 ,,	1908-9	...	305,044 ,,
1902–3	...	130,524 ,,	1909-10	...	329,976 „
1903-4	...	151,128 ,,	1910-11	...	420,372 „
1904–5	...	253,908 „	1911–12	...	564,372 „

Besides the above, it is estimated that 3,000 tins of pulped eggs were held in stores.

ESTIMATED LIVE POULTRY on Farms and Holdings of 1 acre and upwards.

At end of Year.	Fowls.	Ducks.	Geese.	Turkeys.	Other.	Estimated Number of Eggs obtained during Year.
	No.	No.	No.	No.	No.	doz.
1907	3,092,364	242,782	29,730	211,556	18,573	12,388,700
1908	2,721,986	229,870	25,631	193,613	24,514	11,305,299
1909	2,672,385	257,741	25,878	224,187	36,000	12,096,859
1910	3,072,375	315,550	28,980	244,456	35,015	13,204,906

Imports.

QUANTITY OF PRODUCE inspected under the Quarantine Act (Plants), 1911.

Description.	January to June.	July to December.	Total.
Bananas (bunches)	267,871	322,933	590,804
Pineapples and bananas .	10,535	13,235	23,770
Fruit (centals)	10,337	42,366½	52,703½
Cereals, pulse, &c.	272,453	94,934	367,387
Vegetables, corms, &c.	2,171	3,554	5,725
Nuts and nutmegs	13,504	10,370	23,874
Plants, No.	144,106	7,038	151,144

Exports.

STATEMENT OF PRODUCE inspected under Commonwealth Commerce Act for twelve months ending 30th June, 1911.

Description.	Packages.
Canned Fruit	4,115
Fruit	149,434
Hares, 1st class	1,464
„ 2nd class	635
„ unclassed	73
Honey	298
Jam	4,805
Leather	14,637
Maize	3,241
Millet	132
Plants	891
Potatoes	35,638
Rabbits, 1st class	563,641
„ 2nd class	120,620
„ skinned	18,169
„ unclassed	5,103
Seeds	7,771
	930,667

STATEMENT OF PRODUCE inspected from 1st July to 31st December, 1911.

Description.	Packages.
Canned Fruit	1,143
Fruit	116,083
Honey	53
Jam	3,915
Leather	7,790
Maize	2,747
Millet	22
Plants	473
Potatoes	12,469
Seeds	3,416
Hares	645
Rabbits	303,780
	452,536

RETURN showing the Oversea Exports of Live Poultry, Frozen Poultry, and Eggs in Shell from the State of New South Wales during the year ended 31st December, 1911.

Destination.	Live Poultry.								Poultry Frozen.				Eggs in Shell.					
	Ordinary.		For Breeding Purposes.															
	New South Wales.		New South Wales.		Other Australian.		Foreign.		New South Wales.		Other Australian.		New South Wales.		Other Australian.		Foreign.	
	No.	£	No.	£	No.	£	No.	£	Pairs.	£	Pairs.	£	Doz.	£	Doz.	£	Doz.	£
New Zealand	24	6	35	35	46	86	20	30	...	...	...	...	42	17	10	18	...	...
Canada	26	20	24	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fiji	363	93	234	96	...	...	...	...	...	...	...	...	108	5	...	...	...	...
British New Guinea.	295	88	15	8	...	...	...	...	...	...	...	...	1,864	139	...	...	...	...
Ocean Island	149	36	...	...	...	...	...	...	...	...	...	...	558	37	...	...	...	...
Kaiser Wilhelm's Land	63	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Marshall Islands	34	12	17	13	...	...	...	...	...	...	...	...	712	46	...	...	...	...
Neu Pommern	39	10	12	3	...	...	...	...	5	2	...	...	597	40	...	...	...	...
New Hebrides ..	50	12	36	17	...	...	...	...	...	...	...	...	...	...	...	...	...	...
South Sea Islands ..	132	23	59	21	...	...	...	...	3	4	...	...	603	43	...	...	96	3
Ceylon ..	...	...	6	7	...	...	...	...	144	65	...	...	...	...	...	...	...	...
India	...	...	...	...	4	5	...	...	...	...	...	...	...	...	...	...	...	...
Natal	...	...	4	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Straits Settlements ..	...	...	41	21	...	...	...	...	2,545	1,070	...	...	...	...	...	...	...	...
Caroline Islands	...	...	15	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Java	...	...	3	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Philippine Islands ...	...	...	61	44	...	...	...	...	1,355	788	201	90	...	...	...	...	...	...
Hong Kong	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	96	3
Total	1,175	308	562	290	50	91	20	30	4,052	1,929	201	90	4,484	327	10	18	192	6

NEW SOUTH WALES.

Principal Articles Imported Oversea.

Articles.	January to December.		
	1909	1910	1911.
	£	£	£
Ale and beer ...	143,048	138,657	175,172
Apparel and soft goods . . .	4,587,579	5,366,163	5,739,716
Boots and shoes	118,790	153,350	161,230
Confectionery . .	44,911	41,115	123,997
Cordage and twine ..	279,269	276,275	316,695
Fish—all kinds	168,882	195,516	220,134
Fruits—fresh .	108,882	58,593	132,199
Gold—coined and uncoined	585,578	527,431	1,077,716
Hats and caps	122,993	151,323	164.128
Implements agricultural	131,508	214,688	213,382
Iron and steel—bar, rod, &c.	343,358	456,044	520,246
,, galvanized sheet	477.232	527,926	527,985
Leather .	173.305	139,299	146,485
Machines and machinery ...	1,487.916	1,358,329	1,695,371
Metal manufactures -			
Dutiable .	483,782	618,266	853,514
Free .	717,067	781.213	908,750
Milk—preserved .	75,196	65,886	48,593
Oil—kerosene .	195,964	161,115	149,020
Spirits . .	464.297	472,710	548,080
Sugar	724.378	307.794	336,748
Tea . .	475,807	560.475	540,761
Timber	751,463	820.101	1,164,555
Tobacco, cigars, &c. ..	269,806	373,264	434,551
Wine	13,312	16.636	17,283
Other articles	7.916,661	9.375.250	11,114,029
Total ... . £	20,860,984	23,157,419	27,330,340

Principal Articles Exported Oversea.

		Year 1911.		Year 1910.	
		Quantity.	Value.	Quantity.	Value.
Animals—Horses	No.	1,726	56,754	1,961	62,876
Butter	lb.	33,083,464	1,524,358	27,395,201	1,239,639
Coal	ton	1,701,687	906,438	1,703,119	911,251
Copper, ingots and matte	cwt.	526,048	1,496,263	480,699	1,364,042
Fruits—Fresh	cntl.	63,154	44,788	57,729	42,281
Gold—Coined, uncoined		....	4,135,998	....	1,554,089
Grain—Wheat	cntl.	7,334,047	2,168,852	6,696,973	2,381,142
Flour	,,	879,916	366,412	568,923	266,722
Lead	cwt.	1,587,250	1,006,030	1,641,882	968,380
Leather		....	321,026	....	337,141
Meats—Beef	lb.	8,294,830	76,180	8,745,361	97,878
Mutton and lamb	,,	59,948,989	682,027	90,729,476	1,007,883
Rabbits and hares	pair	6,806,446	330,754	8,007,068	406,762
Meat—Preserved	lb.	22,249,579	435,579	19,508,163	358,163
Oil—Cocoanut	cwt.	101,914	181,029	105,069	192,145
Ores, spelter, &c.		....	996,686	....	878,516
Silver bullion	oz.	2,315,803	224,269	2,511,077	244,858
Skins—Hides	No.	322,177	347,167	234,062	245,669
Sheep	,,	2,432,478	264,667	3,488,623	437,245
Rabbit and Hare	lb.	5,818,839	296,678	5,650,400	329,616
Other		....	362,984	....	589,841
Tallow	cwt.	629,158	897,763	648,131	976,335
Timber		....	284,750	....	264,038
Tin, ingots, &c.	cwt.	46,378	426,197	55,170	428,018
Wine	gal.	71,269	19,231	42,205	13,413
Wool	lb.	301,727,885	12,150,085	332,495,839	14,242,386
Other articles		....	2,141,127	....	2,195,119
Total	£	....	32,144,092	....	32,035,451

WINTER FEEDING OF BEES.

MR ALBERT GALE advises those who have not stored honey for their bees during the winter, and who consequently must artificially feed them, to obtain inferior honey for the purpose from some of the agents in Sussex-street. The honey should be warmed, placed in a bottle, and stopped with a cork in which three notches are cut, so that the honey can drip out. Stand the bottle *within* the hive, cork end downwards.

The above is the *best* method. The *cheapest*, Mr. Gale says, is to use 12 oz. powdered loaf sugar, 4 oz. brown sugar, and a tablespoonful of fine flour (pea flour is the better). Mix well, and add enough water to produce a rather thick or stiff batter. Put over a slow fire, and keep it stirring for about a minute while boiling.

Mortality in Incubator-hatched Chickens.

A. L. WYNDHAM, Poultryman, Wagga Experiment Farm.

ONE of the chief causes of death of young chickens hatched in incubators and reared in brooders, is what is commonly known as white diarrhœa. We have been favoured by Professor Stoneburn, of Storrs' Agricultural Experiment Station, United States of America, with a report on the progress of the investigations into the causes of the disease in the United States during the past thirteen years. Professor Stoneburn also asks for the co-operation of all poultrymen interested in the problem, desiring experiences of epidemics of the disease and results obtained from efforts made to prevent or cure it. We herewith append his results, together with a description of the symptoms of the disease, preventive measures, &c., extracted from Bulletin No. 68 of the Storrs' Agricultural Experiment Station :—

The disease of young chickens commonly known as white diarrhœa is caused by a specific organism--*Bacterium pullarum* (Pettger, Yale University, 1899).

The mother hen is the original source of infection, the specific organism being present in the ovary ; consequently the organism is to be found in the yolks of a certain proportion of the eggs produced by infected hens, and chicks from such eggs have the disease when hatched.

Normal chicks may contract the disease by taking the organism into the digestive tract, as has been demonstrated by experiments with artificially-infected food ; therefore, infected chicks probably transmit the disease to normal chicks through the infected droppings.

Infection through the food supply takes place at an early age, in all probability within the first three or four days after hatching.

Symptoms of Bacillary White Diarrhœa.

We do not wish it to be understood that all of the following symptoms will be observed in every chick suffering from bacillary white diarrhœa ; but almost all of them will be apparent in epidemics of any size.

The earliest deaths may occur within a very short time after hatching, without any prominent symptoms, excepting, perhaps, weakness and lack of vitality. The characteristic whitish discharge from the vent soon makes its appearance in the flock, the time depending, without doubt, upon the virulence of the organism and the mode of infection. The discharge may be slight or profuse ; in colour white or creamy, sometimes mixed with brown.

The voided matter has a more or less sticky or glairy character. It may simply streak down below the vent, or may cling to the down in sufficient quantity to seal up the vent. This is the condition that poultrymen designate as "pasting up behind." This latter condition, however, is not necessarily indicative of white diarrhœa.

The chicks become listless and sleepy, inclined to huddle together, and remain under the hover much of the time. They seem to lose appetite, and do not eat much. Frequently, when they attempt to take food, their action is more or less mechanical. The wings begin to droop and project slightly from the body, with feathers ruffled. In acute cases the eyes are closed, and the chicks become indifferent to everything that goes on about them. Many chicks peep or chirp constantly, the sound being shrill or weak, according to the strength of the individual.

Frequently, when endeavouring to void the excreta, the chicks utter a shrill twitter, apparently a cry of pain. The breathing may be laboured, the abdomen heaving with each breath. Occasionally one may note a certain amount of gasping or gaping. During the progress of the disease the chick may die suddenly while still fairly strong. When the disease is prolonged the chicks gradually waste away, becoming weaker and weaker until they are scarcely able to support their own weight. In this stage they will be often seen to rest against foreign objects for support, standing with legs braced apart, squatting or lying utterly helpless.

Frequently the chicks take on the appearance which poultrymen call "short-backed." The back seems to shorten, and the abdomen protrudes out of proportion, causing the chick to look stilty as compared with one of normal development.

With few exceptions the deaths from bacillary white diarrhœa occur while the chicks are under one month of age. After this a few straggling deaths may occur, and, if complications set in, a high mortality may be observed.

The chicks which have had bacillary white diarrhœa seem to be greatly weakened in constitution, and fall an easy prey to disorders which would be resisted easily by normal chicks.

Those which survive remain more or less stunted in their development. Frequently they are misshapen, with long beaks and "crow" heads, and with imperfect feathering. In every way they impress one as being weak and lacking in vitality. This condition may persist indefinitely, or the bird may slowly regain vigour and vitality, and finally make fairly satisfactory development.

The female chicks which survive often harbour the infection, and may become bacillus carriers. Infection in the breeding pens is perpetuated in this manner.

In all probability infection does not pass from adult female to adult male. Whether or not adult birds may be infected with *Bacterium pullarum* is a matter which is still undecided.

But should both these agencies be eliminated, there is apparently but one explanation for the presence of the organism in question in the ovaries of adult females—that they were infected chicks which survived the disease and continued to carry the organism in their bodies, not in the various organs, as when they were young and visibly affected, but locally, as in the ovary. Examination of ovaries of the half-grown pullets has given us strong evidence in support of this theory.

Practical Preventives.

If the eggs from different pens are hatched separately, and the chicks segregated for the first few days, it will soon be made apparent through the condition of the chicks which pens contain infected hens. To determine which individual hens are affected, the trap nest should be used, and the same general procedure followed.

Another possible means of determining infection of breeding hens, is the direct examination of the ovaries. It is entirely practicable to inspect these organs through an opening in the side of the bird similar to that made for caponising. No matter how badly infected the ovary may be, a large number of the ova are apparently normal. Little or no change of shape is observed in the small pathological ova, but they are more or less discoloured, and frequently show slight changes in texture. The larger infected ova, however, often present striking variations in shape and texture. They are frequently decidedly angular, and vary in their consistency from soft and liquid to firm and cheesy. There are various degrees of discolouration, from slight to marked. At times some of the ova are found to be a peculiar bright yellow; again, they may be quite dark, almost black, and occasionally more or less mottled.

From the time they begin to hatch until the chicks are removed from the incubator, the incubator should be kept dark. This will largely prevent the chicks from picking at the droppings.

Food and water should be supplied in such a manner as to prevent contamination with infected droppings. The use of a fine, absorptive litter in the brooder, especially for the first few days, is also advisable.

The Use of Methylated Spirits.

With the approach of the hatching season, we advise the use of methylated spirits in which to dip eggs previous to incubation. The dipping should be done just before the eggs are placed in the incubator, allowing only sufficient time for the methylated spirits to evaporate off the eggs.

This process has been in use at Wagga Experiment Farm for a season, and its beneficial nature noted in the practically non-existent death rate of brooder chickens, where in past years a small percentage was generally lost, mainly from white diarrhœa.

It is not desired, however, to advertise this process as a "cure-all." Where poultrymen have experienced losses of this nature in the past, the usual precautions, such as disinfection of incubators, &c., should in no way be relaxed. The dipping is only done as an additional safeguard.

Full strength methylated spirits may be used, but the same quantity should not have more than two separate lots of eggs dipped in it.

The eggs should be only immersed in the spirits and then withdrawn, not allowed to soak therein by any means. They may be allowed to dry on the tray which is going to be placed in the incubator, but the tray should not be placed on a varnished table while the eggs are drying, as the methylated spirits will spoil the varnish.

DESTROYING COCKROACHES.

MANY baits are used for cockroaches. Paris green puffed into their hiding places will clear them out. Equal parts of chocolate and borax, ground up fine and well mixed, if placed in their runs, will soon kill them out. Borax mixed or sprinkled over moist bread-crusts in a saucer will also kill them. Phosphorus paste, as supplied for rat poison by the chemists, will attract and kill them.—WALTER W. FROGGATT.

THE DETECTION OF POISONOUS MUSHROOMS.

IT is very difficult to advise how to distinguish the poisonous mushrooms from the non-poisonous ones, as we know so very little of the chemistry of the toxins found in poisonous fungi, especially those indigenous to Australia.

The chief safeguard in choosing mushrooms or other fungi desirable for culinary purposes is to become acquainted with the outward features of those that have long ago been tested and recognised as the best kinds. When once the characters are known there should be no fear of error, as the structural characters of fungi, as in other sections of plant life, are fairly constant. Good fungi have usually a pleasant odour, and if a fragment is tasted when freshly gathered it should possess an agreeable nutty flavour, and should not have any acidity, sharpness or tingling sensation upon the tongue.

A further test which is sometimes a useful aid, is to cut a specimen with a knife; and if when cut, or sometimes even when bruised, the parts turn a bluish or greenish colour, it is a most suspicious indication that they have bad qualities. All fungi having a disagreeable odour or a pungent flavour, and showing a tendency to turn blue or green when bruised or cut, should be avoided, or if tried at all, used with very great caution.

The pink colour underneath is not a safe guide, as some of the Amanitas have pinkish-coloured gills, and yet this genus contains species which are very poisonous. Others that have pinkish-coloured gills in the early stages of development are edible while in this stage, but afterwards turn black and are then very dangerous.—GEORGE HARWOOD Botanic Gardens, Sydney.

Woolly Aphis, or American Blight.

(*Schizoneura lanigera*, Hausman.)

WALTER W. FROGGATT, F.L.S., Government Entomologist.

THIS familiar apple pest is well known under both the above popular names, though several American entomologists have protested against their country being credited with being its native home, and claim that the name "American Blight" is a misleading one, as it was known in Europe long before it was noticed in America. It was first recorded from Europe in 1787, and in the early part of the following century spread over France, Germany, and Belgium. Fitch states that nurserymen informed him, in 1848, that it was very prevalent in Virginia and Pennsylvania, where thousands of trees had been destroyed by this pest. It appears, at any rate, to have been introduced into England by way of America, for Sir Joseph Banks traced it, in 1789, to a London nursery, whose owner had imported apple-trees from America, but it is not improbable that it was previously taken to America from Europe, and imported into England *viâ* that country. The original home of many of our commonest garden and orchard pests becomes a matter of conjecture as soon as their food plants become articles of commerce, and, at the present time, "Woolly Aphis" is found in nearly all the countries where apples are cultivated.

This aphis attacks apple-trees in two different ways, first upon the roots, and secondly upon the trunks and branchlets, and our experience is that any trees having the roots infested will soon show signs of the pest upon the upper portion of the stem, as in early summer one can watch them crawling up the trunks from the roots in regular droves. It has been claimed by a number of writers that the root-infesting aphis is a distinct species from that found upon the branches; Buckton has described an allied species under the name of *Schizoneura fodiens* found upon the roots of black-currant bushes. Theobald states that in all cases where he has examined woolly aphis, taken from the roots of apple-trees in English orchards, he has found them to be Buckton's species (*S. fodiens*), and not the true woolly aphis of the trunk (*S. lanigera*). In reviewing French's "Handbook," in the second volume of this *Gazette* (1891), Oliff says: "But it were, perhaps, hardly necessary to allude to the long forgotten error, that the root-form and branch and trunk-form of woolly aphis are distinct species, in terms that imply that the question has required investigation by our local observers for its settlement. For many years it has been as well established a fact that these two forms are only phases of the same insect, as that the leaf and root-form of the dreaded vine-pest phylloxera are specifically identical."

The practical application of producing blight-resisting apple stocks is due to the experiments of Messrs. T. Lang and Co., the well-known Victorian nurserymen, in 1868-70, who used a variety known as the "Majetin," their attention having been drawn to this stock by a note in Lindley's "Guide to the Orchard." They also introduced the "Northern Spy" from America, and proved it to be perfectly immune from the attacks of this insect. And these facts are so well established that now, instead of the old haphazard methods of using any kind of apple stock, all other varieties of apples are grafted upon these and other blight-proof stocks. It is, therefore, only a question of good cultivation and time, when all the old infested apple orchards have run out, that woolly aphis will die out in Australia, for, unlike America and Europe, we have no species of wild crab apples growing in our scrubs or forests that can prolong its existence. When varieties of apples susceptible to woolly aphis, but grafted on blight-proof stocks, are planted in an orchard where there are other apple-trees growing that are infested with the aphis, either upon the roots or branches, though they are powerless on the blight-proof roots, they will soon find a lodgment above the graft, particularly if the bark gets broken or scarred, and when once established will commence to breed and form cankers, which will, if neglected, soon swell out into unsightly knots. But in a modern up-to-date apple orchard, properly looked after, away from old infested orchards, there will be no woolly aphis to render the trees unsightly and diminish the crop.

The production of these root and branch galls or excrescences is caused by the irritation to the plant tissue by the many sharp, lance-like beaks of the aphides piercing the bark, and, while sucking up the sap, promoting an excessive flow to the injured spot, which forms a spongy growth that is continually increasing in size while the aphides are alive; but destroy the insects, and it is wonderful how quickly the injured places heal over, and the galls disappear as the tree thrives. Many writers state that the woolly aphis only infect an injured spot on the bark, and as long as there are no scars or cuts from pruning there is no foothold for the pest; but this is not correct, for where they are plentiful they will cluster round a leaf-bud and insert their beaks into the bark and form regular ridges along the tender branchlets.

In old trees grafted upon stocks that are not blight-proof, the base of the trunk—where it comes in contact with the earth—the main, and all the smaller radiating rootlets are covered with nodules, or much more gall-like excrescences, growing together, so that a root no thicker than one's finger is often swollen out into great masses. It is somewhat remarkable that although no doubt some trees do die clean out from the attacks of this aphis, other trees may be infested for many years, and, through neglect, become gnarled and knotted both above and below ground into most fantastic forms, yet they will manage to exist and bear fruit for a number of years. Trees aborted after this fashion may be met with in many old orchards and gardens all over the State; of course they do not produce a decent crop of fruit of marketable value when gathered, and would be much better dug out to make room for good trees.

In aphis-infested orchards in New South Wales, the pest begins to show upon the trees towards the end of summer, and as the leaves fall off, and the winter rains set in, it soon spreads all over the trees, the festoons of white wool hanging in little tufts all along the branches, but though it shows most about this time, live aphides can be found in an infested orchard all the year round. They cannot withstand excessive heat or hot winds, and in the dry western country I have seen them lying in little heaps scorched up and dead beneath the trees after a real "hot-wind" day. Towards the end of summer, lady-birds, chiefly *Leis conformis*, and several small *Rhizobii*, as well as lace-wings and other enemies, do a great deal in reducing their numbers; but in the absence of the severe winters, which check their propagation for some months in Europe and America, these aphides, like other pests, can breed all the year round in our sunny climate.

Australia.

Observations were commenced early in May, 1902, when a number o infested trees in an orchard near Gosford were put under treatment with various remedies, the results of which are given in detail later on.

At this time of the year the woolly aphis were well developed, little colonies consisting of full-grown wingless females, with numbers of larvæ beneath them, or crawling about among the enveloping wool above them. This brood appears to agree with what Buckton calls pupæ, but, as they are constantly giving birth to living larvæ, are really wingless viviparous females. They were clustered in every cavity on the bark, attached to it by their lance-like beaks, with their legs hanging down free, or resting against the back of their nearest neighbour, but they never rested their legs against the bark; the beak seems quite strong enough to support the body when once they have pierced the bark.

The woolly filaments above formed a regular coat over them, while most of the adults had a globule of liquid attached to the tip of the abdomen, with other fallen globules that had dropped from them entangled and resting among the woolly threads. Under a low power microscope the birth of the larvæ could be easily followed. It is enveloped in a thin transparent skin, which, as the head and thorax are extruded, splits and works down over the body, freeing the antennæ and legs, which are previously folded down the sides, and the whole operation may be completed under fifteen minutes.

The new-born larva has semi-transparent legs and antennæ, with black eyes and a bright yellow body; the general form is elongate oval, with the head slightly rounded in front, and the beak or rostrum, which is folded down between the legs, reaches to or beyond the tip of the abdomen. The larvæ do not appear to settle down at once, but wander about among the adult aphides in a very aimless manner for some time.

Adult Wingless Female.—General colour slate-blue, with a greyish tint, caused by the dust of the woolly secretion, which appears to be an ochreous yellow when dropped into oil of cloves. The apical half of the upper surface of the abdomen is ornamented with numbers of fine white spiral filaments that, curling round, are capable of hiding the whole of the insect. The head is rounded in front, sloping down on either side; the antennæ six jointed, first and second joints short and stout, third very long, fourth and fifth shorter, sixth much shorter, and attenuated at the tip to a finger-like process. The eyes stand out on the side of the head, and the tubular mouth, swelling out into a lanceolate tip, reaches to the base of the hind legs when resting beneath the body ; the thoracic portion, to which the long slender legs are attached, is merged into the abdomen, which, oval in form, is broadest in the centre There is a slightly raised boss on either side of the back, surrounded with a brown ring (which represents the long cylindrical nectaries or honey-dew glands upon the bodies of the other groups of aphides), the extreme tip of the abdomen terminating in a rounded knob, clothed with fine hairs.

Winged Form.—These consist of adults of both sexes of a general dark, dusky brown colour, with large, slightly smoky wings, rounded at the tips, the sexes differing very little from each other except in the structure of the abdominal segments. They have no mouth, small eyes, and short antennæ, their life being very short, and devoted to the production of the winter eggs. In this State they generally appear about midsummer, just after the New Year ; but as the wingless aphides will be found in the crevices of the cankers on the branches all the year round in our summer climate, they evidently do not rely upon the winged forms for carrying on the generations, as is the case in a more severe climate

The above account of the habits of the woolly aphis, published in 1903, does not need any revision ; but since it was penned, a good deal of work has been done in New South Wales in the study of all insect pests. Under the regulations of the Vegetation Diseases Act, there have been a great many worthless apple-trees uprooted and burnt, which, among other diseases, were usually badly infected with woolly aphis, so that there is a marked improvement in many districts But, in spite of the fact that all our apple orchards for a good many years back have been planted with blight-proof stocks, there are numbers of seedlings and grafted apple trees in the smaller orchards that are on their own roots, and each one of these, when found by the aphis, is a centre of infection for all the other apple trees growing in the district

The grafting of the apple wood upon the blight-proof stock, of course, does not render the stem and branches above the graft immune : and while the roots of "Northern Spy" and "Majetin" varieties are perfectly free from aphis, the tree itself may, if neglected, soon become cankered and covered with excrescences and galls from woolly aphis, carried by the wind, birds, and other agencies, from some other previously infested tree

I know no bark pest that is so persistent and difficult to perfectly clean off a tree by sprays, painting, or fumigation, as woolly aphis ; and it is one of those pests that must be absolutely cleaned off, and every insect killed, or it will come up smiling again. A single baby aphis is able to grow and found a new colony that in a very short time will reinfest the tree. There is very little hope that, until all our apple-trees are on blight-proof stocks, we will be able to satisfactorily deal with this apple aphis ; though, at the same time, with ordinary care, and clean roots, we can keep it in bounds. And every orchardist with a new, clean orchard should keep careful watch against its entry, and act promptly when it first appears.

We have reports of woolly aphis appearing in well kept commercial orchards, upon the roots of apple-trees that there is every reason to believe are grafted upon blight-proof stocks. If the roots in question are true to name, the only way that this can be accounted for is that the trees were originally grafted low down, and the soil washed down the hillside, or otherwise accumulating round the trunk, has covered the graft, and roots have been produced near the surface from the trunk of the tree immediately above the blight-proof roots. The surface roots are of tissue that is not immune to woolly aphis. As a general rule, it is the roots within a foot or 18 inches of the surface that suffer from the aphis, though in loose open soil they might go somewhat deeper.

America.

Writing of this pest in America, Harris says:—

> The eggs of this louse are so small as not to be distinguished without a microscope, and are enveloped in a cotton-like substance, furnished by the body of the insect. They are deposited on the crotches of the branches, and in the chinks of the bark at or near the surface of the ground, especially if there are suckers springing from the same place. The young, when first hatched, are covered with a very short and fine down, and appear in the spring of the year like little specks of mould on the trees. As the season advances, and the insect increases in size, its downy coat becomes more distinct and grows in length daily. This down is very easily removed, adheres to the fingers when it is touched, and seems to issue from all the pores of the abdomen. When fully grown, the insects of the first brood are $\frac{1}{10}$ of an inch in length, and when the down is rubbed off, the head, antennæ, suckers, and skin are found to be of a blackish colour, and the abdomen horn yellow. The young are produced alive during the summer, are buried in masses of the down, and derive their nourishment from the sap of the bark and the alburnum of the young wood immediately under the bark.

When this description was penned, in 1841, the winged forms of *Schizoneura lanigera* had not been discovered, but in 1856 Dr. Asa Fitch described the winged generations, which consist of male and female insects, appearing towards the end of the cycle of generations.

At the present time woolly aphis is one of the worst pests in the United States and Canada. In Professor Smith's Bulletin 35, (1907), it is stated that quite half the apple-trees of the State of Georgia are infested with the root form. In Missouri, Wilkeuson says:—"I consider the woolly aphis the most destructive insect that the apple grower of South Missouri has to contend with, and is killing and destroying more trees in this section than all other causes combined." According to the report of the New York State Experiment Station, 1897, woolly aphis is generally distributed all over the United States from Maine to California, and is also well known in Canada. It is a very serious pest in New York State, because that is one of the leading apple and nursery stock producing states of the Union.

In North America the apple orchards also suffer considerably from another species of this family, the apple-leaf aphis (*Aphis mali*). In several orchards near Sacramento, California, towards the end of July, 1907, I saw some orchards where all the trees looked as if they had been sprayed with very dirty oil, the result of the presence of this aphis upon the leaves, the honey-dew they had secreted, and the fumagine brought about through the honey-dew.

Europe.

Several eminent entomologists have studied the life-history in Europe, of which the following is a brief outline. The wingless (apterous) female, called by some writers the "queen or mother aphid," winters in a crevice in the bark of the apple-tree, covered with a little woolly secretion. In the spring she gives birth to small, pale reddish lice, which, as they increase in size, become clothed with a mass of long spiral woolly threads or filaments, which form a protective covering; they produce living larvæ in turn, among which, Theobald says, "occasionally winged females are produced, but they are unusual." In colour they are chocolate-brown, and have the venation peculiar to the *Schizoneura*, and distinctive from other species of the group. The winged viviparous (producing live larvæ) female appears from July to September, and in time gives birth to oviparous (egg-producing) females and males, neither of which have any rostrum or mouth, so their lease of life is short, but long enough to fertilise the egg-laying females. These, before dying, deposit a single egg on the bark of the tree, which gives birth to the queen aphis, and this, though a virgin female, after hibernating produces living larvæ at the advent of spring to carry on the next generation.

Theobald, in his "Insect Pests of Fruit," published in 1909, devotes a considerable amount of space to the woolly aphis, and states that whereas it was at one time confined to the cider orchards of the south, it is now spreading through all the orchards of England. He recommends spraying with a caustic alkali wash early in February, and again early in summer with a kerosene emulsion. While noting the use of blight-proof stocks as a preventive to root infestation in Australia and Africa, he deplores the fact that the British nurserymen have not yet adopted this important method of checking the spread of this apple pest.

When visiting the orchard at Wye Agricultural College, Kent, in 1908, I noticed that a great many of the apple trees showed traces of woolly aphis, and I was informed that they had never tried blight-proof stocks; but I believe Mr. Theobald, Director of the Agricultural College, has since taken the matter up.

Treatment of Infested Trees.

Tobacco.—In my article published in this *Gazette* in January, 1903, an account was given of the treatment of five large apple-trees, badly infested both upon the roots and above ground, in an orchard near Gosford, N.S.W. The method applied to the roots was opening up the earth in a circle of two feet round the trunk and exposing the main roots. Three pounds of waste tobacco was weighed out, and after the galls had been scraped and cut off the main roots, and all the smaller damaged and aborted roots cut clean out, the tobacco was spread over the exposed roots and round the trunk level with the surface of the ground; the earth then filled in, and a bucket of water was poured on at the trunk. The tree was left undisturbed for three months. When these trees were again opened out, both the trunk below the surface and all the roots were perfectly healthy, in spite of the rough treatment, and no signs of aphis could be found. The nicotine, soaking into the bark and coming in contact with the soft-bodied aphides, had destroyed them completely.

This tobacco treatment is cheap, and the residue of the tobacco has a certain fertilising value. The tobacco, however, does not last, and where the roots are badly infested the aphides work back and upwards to the trunk, and the treatment requires to be renewed every season. Where tobacco waste is plentiful, as in many of the southern apple States in America, it is very largely used to keep down the woolly aphis upon the roots of the apple-trees, and when it can be renewed regularly and cheaply, it seems a a very efficient and simple remedy.

Fumigation with Hydrocyanic Acid Gas.—This method, so successful with scale insects, was also used upon the woolly aphis under the same conditions, and on the removal of the tent all the clustering aphides were found dead, hanging up by their beaks. Everything was apparently dead, but when the branches of the tree were carefully examined three weeks later, here and there in the crevices a few live aphides were found, the tell-tale woolly secretion showing that they had very soon formed fresh colonies. It is therefore evident that to make a perfect clearance the fumigation would have to be repeated within about a month or six weeks.

Oil Emulsions.—The only method, in a commercial orchard, to clear the colonies of aphids off the trunk and branches of an infested apple-tree, appears to be the use of some oil emulsion sprayed on with good pressure, and the more thorough the drenching of all cracks and crevices the more perfect the cure. Kerosene emulsion and red oil emulsion were used by Mr. Gurney at a strength of 1 in 10 in some experiments at Narara in 1909. The results show that while both appear to be about equal in effect, the red oil hangs better to the bark and is more lasting.

Painting Trees with Oil.—Where only a few trees are to be treated in a garden, I have seen very good results from painting the infested spots with castor oil or raw linseed oil with an ordinary paint brush, but of course this could not be done in a regular orchard.

In the United States, where the woolly aphis do not usually attack the trunk and branches as badly as they do in this country, but are just as bad in the root form, many experiments have been carried out. A great deal of valuable information is given in a report by Mr. R. I. Smith in a Bulletin of the Georgia State Board of Entomology, 1907, "Woolly Aphis of Apples and Remedial Measures, with particular reference to the destruction of the root form." He states that the apple orchards of Georgia contain something like 2,000,000 trees of all ages, of which fully half are more or less infested with the root form of woolly aphis, and he estimates the loss to the apple growers from this pest at 150,000 dollars, or £30,000. As the Nursery Inspection Law of Georgia compels all nurserymen to discard and burn all visibly infected trees, this is also a very serious annual charge upon all growers of nursery stocks.

Tobacco and Kerosene Emulsion for Root Aphis.—Smith's experiments were all carried out against the root forms, and he found that tobacco in all forms, while killing all aphids with which it came in contact, had no lasting result.

Opening up the soil and exposing the roots in the same manner as for tobacco, he sprayed, or rather drenched, all the roots with kerosene emulsion, made by the regular formula of kerosene 2 gallons, water 1 gallon, and soap

½ lb. He used this in varying strengths, from 10 to 40 per cent. of added water. He says:—

> Without going into details concerning the different tests of the kerosene emulsion, it may be stated that all the aphis were killed by every application, from the weakest to the strongest, wherever the emulsion came in contact with the infected roots. Another important point is that the odour of the kerosene remained in the soil for nearly four months to the depth of a foot. As a repellant, the kerosene emulsion acts perfectly. It is true that aphis may live outside the circle treated with the emulsion, but as long as the odour of the kerosene remains in the soil, the young aphis will not work back to the main roots of the trees.

He warns the growers, however, not to use kerosene emulsion on dormant trees, but if the trees are treated at the proper time, there is no danger with even up to a 40 per cent. emulsion, while 10 to 15 per cent. emulsion is quite effective. The early summer, when the trees are growing, is the proper time to use kerosene emulsion, and this has also the advantage of killing off the aphis before they have done much damage.

Bisulphide of Carbon Treatment.—The injection of this chemical into the soil round the trunk of the infested apple-trees has been recommended by a number of experts in the United States as a means of killing woolly aphis on the roots. In Circular No. 20 of the United States Bureau of Entomology, 1908, Marlatt, writing on "The Woolly Aphis of the Apple," says:—

> The use of bisulphide of carbon for the woolly aphis is the same as for the grape root aphis. It should be applied in two or three holes about the tree to a depth of 6 to 12 inches, and not closer than 1½ feet to the crown. An ounce of chemical should be introduced into each hole, which should be immediately closed. The bisulphide evaporates and penetrates throughout the soil, and readily and promptly kills the aphids. It does not, however, furnish any protection from future attacks, and is attended with danger to the tree unless the precautions named are carefully observed.

Professor J. M. Stedman, in the 35th Bulletin of the Agricultural Experiment Station of Missouri, 1896, details his work with regard to woolly aphis upon the roots of apple-trees in that State. In his first experiments he injected from 2 to 3 ounces to each tree, and found that wherever the bisulphide came in contact with the tree it killed it. Later on he again used this chemical upon 35 infested apple-trees, keeping away a foot from the trunk of the tree and injecting on two or three sides of the tree, using 3 ounces to each. Two months afterwards these trees were examined, and he says:—

> We could find no aphids on the roots of any of these trees, except those that were injected on one side of the trunk only; on all such we found living aphids on the untreated side. There was no apparent difference in the results between those treated with two or three injections, nor in those injected 1 or 2 feet away from the trunk. In no case could any injury to the tree be observed. This being the case, I should advise one to always make the application 2 feet away from the trunk, and on but two sides.

Following Professor Stedman, the State Entomologist of Georgia, previously quoted, also experimented with bisulphide of carbon on the apple roots, but his results were anything but satisfactory, though apparently carried out in a very careful manner. The tests were made in 1905 and 1906. He says:—

> It was found that the woolly aphis were killed over an area of a few inches around where the application was made, but in all instances where the trees were uninjured the aphis were alive in spots between the holes in which the liquid was applied. All the trees receiving as much as 2 ounces on three sides, at a distance of 12 inches, were killed or badly injured. This was the result of treatment at Morrow. At Cornelia the strongest application given was 1 ounce on four sides of the tree, at a distance of 18 inches from the trunk. This treatment did not injure the trees nor did it kill the aphis.

From these extracts from American reports, it is evident that the action of bisulphide of carbon is very variable in different classes of soil, and on account of the expense, and danger to trees by careless manipulation, it will hardly come into general use in small orchards.

From these experiments in America, and the experience we have had with vines in Australia, the following suggestions might be made :—

Before using the injector, make a circle round the trunk of the tree 2 feet away from the trunk, or 4 feet in diameter; then inject, with an ordinary Vermorel injector, half an ounce of bisulphide, at equal distances on the line of the circle, so that there is half an ounce on each of the four sides of the tree. If the tree is large, a second ring might be made 2 feet beyond. and a quarter of an ounce of bisulphide injected at equal distances. None of the liquid should be injected on to the trunk, or directly on to the main roots. This could be varied to suit the different class of soil, but, as noted before, usually all the live aphids on the roots are within a foot or 18 inches of the surface, so that the heavy sinking fluid should spread all through among the roots

If, when planting out new fruit-trees from the nurseryman or dealer, the orchardist would only go to the trouble of dipping the roots and butts into a bucket of kerosene emulsion, washing them first so that all dirt is removed, and again, after they have been well drenched with emulsion, washing them before he plants them, he would destroy many tiny little creatures, as well as aphis, that are so easily introduced, and so difficult to stamp out when once they gain a foothold.

TRIALS OF IMPORTED BROOM MILLET SEED.

IN view of the reported deterioration in the quality of the broom millet grown on many North Coast farms, the Department of Agriculture last year obtained from the Agricultural Departments of the United States and Italy, selected samples of seed of the varieties grown in those countries. These were divided up and sent to the Hawkesbury Agricultural College and Experiment Farms for trial in comparison with local seed.

The reports received indicate that under our conditions these varieties will be quite useless for broom-making purposes. They are really millets, whilst ours is a sorghum. The imported varieties nowhere grew to a sufficient height to be of commercial value for broom-making, though it is reported from Bathurst Experiment Farm that the one imported from Italy should be suitable for ensilage, or, if cut on the green side, should make fair hay. It is not certain, however, whether the seeds sent were really those of the plants grown for broom-making purposes, as in the United States the crop is known as "Broom Corn." Further inquiries are being made as to the identity of the seeds.

It would appear, nevertheless, that the best prospects for improving our broom millet lie in the careful selection of seed from the variety already grown. The practice of taking the seed without selection from the bulk, as the brush is being prepared for market, often results in immature seed being used. Farmers might easily permit a small area to ripen thoroughly, and select their seed from it, just as progressive wheat-growers are doing. The small quantity of seed required to sow an acre of broom millet makes it a simple matter, not involving the sacrifice of much of the crop.

Phylloxera-resistant Stocks.

PLANTING STOCKS READY-GRAFTED WITH EUROPEAN GRAPE-VINES.

M. BLUNNO, Viticultural Expert.

THE planting of a vineyard with vine rootlings ready-grafted on phylloxera-resistant stocks requires certain care, the neglect of which may lead to the loss of many plants.

These rootlings are generally despatched from the vine nurseryman, packed in a mixture of sea-grass and sawdust, which is sufficiently damp to prevent the rootlings from drying, but at the same time not wet enough to cause the plants to heat up and mould. When the vigneron gets the plants, he does not need to unpack them immediately, provided he is ready to plant them within the next seven or eight days, during which he can keep the packages in a place sheltered from winds or sudden changes of temperature. A cellar or any like place is suitable.

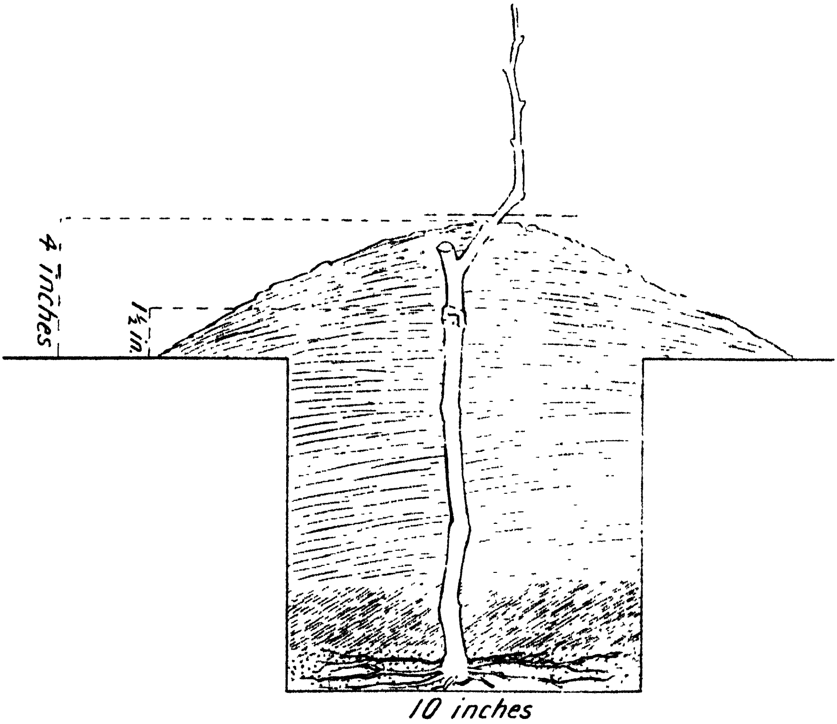
These rootlings often have to travel a long journey, as for example, those that are imported from Europe. In such case it is *a necessary precaution* to place the packages in the refrigerating chambers, with which all the big ocean liners are now supplied. The plants are quite safe if the temperature does not rise above 38 or 39 degrees F. When the plants arrive from such a long distance, they should at once be unpacked, and be put in water up to the crown, and kept there for 24 hours. If the water could be kept running all the while, it would be better. If the vine-grower is not ready to plant them, then the bundles of rootlings are placed side by side, upright, in trenches opened in a light, well drained soil, or better still in sand, care being taken that the particles of soil or the grains of sand will fill well the interstices between the stems, between the roots of each bundle, and between bundle and bundle. The rootlings must be so covered as to protect the whole of the zone where the graft is, as well as the whole scion and a couple of inches of the young canes. The top of the soil or sand is lightly sprayed with water. To prevent the partial drying up of the plants, while waiting for the suitable time to plant them out, will be the principal aim of the grower; therefore the soil or sand in which they are bedded should always be in a fairly moist condition.

Planting.

The bundles are removed from the trenches as they are wanted. The roots of each plant are shortened down to a length of 4 or 5 inches. It will be found that some rootlings have roots close to the graft. Thick roots should be cut clean off, and only those growing from about the bottom should be left.

The rootling may have more than one cane. In such case only the best is left, and all the others are cut clean off. After this, the rootlings are put in water, from which they will be drawn as they are wanted, the boy assisting the planter carrying them in a bucket with some water. If operations are conducted on a large scale, then 300 or 400 rootlings are put on a stretcher or wheelbarrow, and protected by wet bags.

A hole is dug, at least 10 inches by 10 inches, and of a depth suitable to the length of the stem of the rootling. The bottom of the hole is broken up fine with the spade, and possibly some sand or light soil is thrown into the hole. On this soil the planter will spread out the roots of the young plant, taking care that the stem is kept in the line of the row, and regulating the depth of the hole so as to have the graft proper about 1½ inches above what the level of the soil will be when the surface of the soil is levelled down.



Planting Rootlings grafted on Phylloxera-resistant Stocks.

About 4 inches of loose soil is then put on the roots at the bottom of the hole, and well pressed down with the foot. I must insist on this detail, which is often overlooked or carelessly done. It is necessary that the soil should adhere well to the roots all round. The holes are then filled up with more soil well broken up, and a mound is made round the stem so as not only to cover the graft proper, but to have the graft protected by a layer of

4 inches of soil. There might be an inclination, in order to save labour, to make this mound too small. The mound should have a large base, so that the graft proper may be protected all round by sufficient soil, and thus keep the young tissues of the knitted zone in fresh condition.

I said that when the soil is finally levelled down the graft proper should be about 1½ inches above the level of the soil. Experience has shown that in hot climates the best results are obtained when the graft proper is from 3 to 4 inches over the level of the ground. To ensure this, it is evident that a larger mound of soil should be earthed up round the graft.

As shown by the illustration, the cane of the rootling is not cut back before the planting. The cane, of course, must be cut back, but this is done only when its top buds are about to burst. Then the cane is cut level with the top of the mound; or botter still, the mound is loosened on top and the cane cut back, so as to leave a spur with 2 or 3 eyes only. Then the mound is made up again. In countries where there is a risk of long dry spells, either in winter or spring, the cane should *never* be cut back at the time of planting, but as already stated, the rootling should be planted with its cane, and this cut back only when the top buds begin to swell and are ready to open. The reason for delaying the cutting back of the cane is that were it cut before planting the small spur thus left would run the risk of drying up if the weather should keep dry.

When the young shoots are from 12 to 16 inches long, it is necessary to undo the mound of soil earthed up round the graft, and all the roots that have grown round the graft or on the scion are carefully cut off. Were these roots allowed to remain, they would grow to the detriment of the real roots, which come from the resistant stock below. Having cut the top roots, a small mound of soil is again earthed up round the graft, but after another 7 or 8 weeks this mound also is levelled down, and the graft is thus exposed to the air.

During the spring and summer that follow the planting, the young plants are still given special attention. The ground should be kept always well worked, and frequent sprayings and applications of sulphur should be made, so that the leaves of the young vines may not be damaged by parasitic fungi.

PEACH TREES AND CLAY SUBSOILS.

In most cases peach trees do not thrive where the roots enter clay subsoils. To overcome the difficulty, one could take a good deal of the clay away from where it is intended to plant the peach, and add fresh loam, also taking care to plant the young tree very high. Instead of digging a deep hole, plant the tree in the ordinary way, but have sufficient soil mounded up for the tree to be planted as high as possible. Another plan would be to ask the nurseryman to supply a peach tree worked on Myrobolan plum stock. This stock is very hardy, and peaches grow well on it.—W. J. ALLEN.

About Eggs.

G. BRADSHAW.

EGGS are such common things that of the millions of people who every morning eat them, probably few look upon them in any other way than as relates to their price and freshness.

Not long ago, from Kansas City, U.S.A., there was consigned to California perhaps the most remarkable cargo of eggs ever despatched to one place, and forwarded by one firm. It totalled 2,000,000 eggs, and made an entire train of twelve car-loads. However, the above is but a trifle in comparison with the 1,000,000,000 eggs produced annually in that country. One arithmetician, fond of figures, has computed that if the above were put end to end they would several times girdle the earth. The same authority says that England consumes 40,000 railway truckloads of eggs in a year; half of them are produced in that country, but the balance come from abroad, Russia contributing one-half of the quantity.

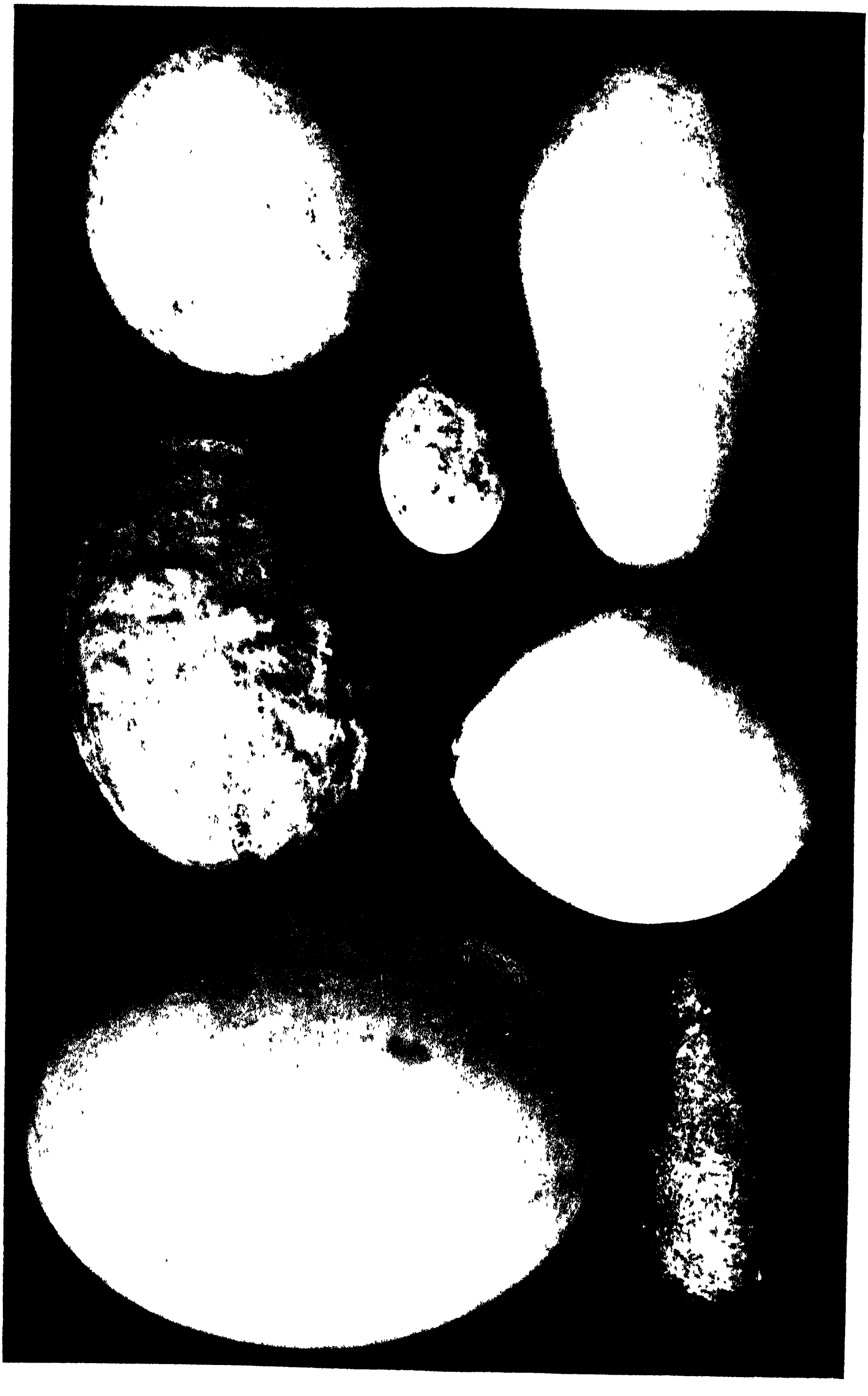
In New South Wales about 14,000,000 dozens of eggs were produced on places of 1 acre and over during the past year. These would weigh over 9,000 tons, and would load over 1,000 railway trucks.

Formation and Production of an Egg.

Anyone upon opening, after death, the body of a hen, will find a cluster of eggs in formation much like a bunch of grapes, and called the ovarium. These, however, are but rudimentary eggs. I have counted as many as seventy in one bunch, and they vary in size from a pin's head to the full-sized yolk of an egg. Each of these eggs is contained within a thin transparent sac, and attached by a narrow pipe or stem to the ovary. During the laying period of the hen these eggs are maturing, and thus keeping up the supply which she lays.

These rudimentary eggs have neither shell nor white, consisting wholly of yolk, on which floats the germ of the future chicken; and as they become larger and larger they arrive at a certain stage when, by their own weight, or other cause, they become individually detached from the bunch, and fall into a sort of funnel leading into a pipe or passage way, called the oviduct. This organ in the hen is from 22 to 26 inches long.

During the passage of this egg to the outer world it becomes coated with successive layers of albumen—the white—which is secreted from the blood vessels of the oviduct in the form of a thick, glairy fluid, and is prevented from mixing with the yolk by the membrane or sac which surrounds it. It is also strengthened by a second and stronger membrane formed around the first immediately after falling into the funnel, and having what resembles two twisted cords of a dense albuminous character, called chalazes, which



PECULIAR EGGS.

pass quite through the white at the ends. These prevent the yolk and germ from rolling about when the egg is moved, and serve to keep the germ uppermost, so that it may receive the heat imparted during incubation.

It is during the passage of the egg through the lower part of the oviduct that it gets covered with the two skins which are found inside the shell. These, although lying close around the egg, become separate at the thick end, and form what is called the air-bubble, or chamber. This in newly-laid eggs is a mere speck, and is that portion which shows the result of evaporation as the egg becomes older, the air-space becoming daily larger, and in very stale eggs is frequently equal to one-fourth of the entire egg. If this air-chamber be perforated with the finest needle, the egg will be prevented from hatching.

When the egg has advanced more than half-way down the oviduct it is still destitute of shell, which begins to be formed by a process of secretion, and when about completed the various shades of brown and tinted colouring-matter are imparted in those breeds to which coloured eggs are peculiar. Sometimes on very brown eggs white spots appear, which can readily be rubbed off. When the shell and colouring are complete the egg continues to advance along the oviduct till the hen goes to nest and lays it.

Peculiar Eggs.

In every poultry yard the owner occasionally finds departures from the normal egg in relation to size, colour, and shape of the contents. These oddities consist of some which weigh up to 6 ounces, rather than the ordinary 2-ounce egg, and are usually double-yolked, or rarer still have three yolks. In other instances a complete egg with the ordinary shell will be found inside another, the yolk and white of the latter surrounding the normal egg and being also enclosed in a complete shell. Another extreme is the not infrequent case of a very small egg. Some are not as large as the ordinary flint marble, the half-thimbleful of contents being minus any yolk, and the shell usually rough.

Then there are crooked eggs, as illustrated. Some have quite a flat side, others have broad, blunt ends, and are thin in the middle. There are some as round as a golf ball, and in other instances the blunt end disappears, the egg gradually tapering from a thick centre to a fine point at each end. A frequently met abnormality is the absence of the ordinary smooth shell, this being replaced by one quite rough. A most pronounced instance of this occurred in four recently found in one case by Mr. Clothier, egg merchant, of Sussex-street. The eggs were received from the Richmond River. All were exactly alike, of the ordinary size, with two blunt ends, the shell all over being a mass of wrinkles, such as we see in crocodile leather.

Perhaps the most extraordinary example of peculiarity is that of one in my possession, which for three-fourths of its length was normal in shape, the balance being minus any shell. The egg appears as if the small end had been sawn off. The lining of the shell kept the contents intact.

There are many other peculiarities, one being that of two soft eggs joined together by a central tube. In one case both of these contained white only, while in another instance one end contained white, and the other yolk.

Hens which lay a white or brown egg keep to this colour all their lifetime, but it has been found that the brown eggs become slightly paler in colour as the hen's laying draws to a close. On rare occasions an almost black egg has been found, but more often amongst those laid by ducks.

Regarding the contents, the colour of the yolk can be influenced by food, and experiments have shown that after a continued diet wherein onions or garlic formed a good part, the eggs acquired the flavour of the food.

There are instances of actually new-laid eggs being almost rotten. Frequent cases occur of a spot of blood in the white or yolk, while worms have also been found in an egg.

The majority of the eccentricities in eggs can be accounted for, while a few are difficult to explain. Eggs are produced from the surplus food, which is that over and above what is required for the sustenance of the hen. If the food is too stimulating, or given in excessive quantities, the result is that in the former case the ova are produced so rapidly that sometimes two of them drop into the oviduct together, resulting in the peculiarities which frequently puzzle the poultry-keeper. These ova travel together along the passage, and receive the white separately, but become enveloped in one shell, and the egg laid is commonly double-yolked, but more properly it is a double egg, the white being duplicated as well as the yolk. Should these yolks be fertilised and the egg hatch, we get the occasional four-legged or other chicken monstrosities.

A different result of stimulating food is obtained when the ova mature in excess of one a day. In place of falling into the passage in pairs as above, the two drop in separately, but on the same day. This results in soft eggs, not from the want of shell-forming material, but rather because the shells cannot be formed as fast as the mature egg is ready for such covering.

Crooked eggs are no uncommon thing in the poultry yard, and are explained as follows:—Twenty-four hours are usually sufficient for the formation of a perfect shell, but when by stimulation a second ovum falls close on its predecessor, reaching it before laid, the second egg, which is up to this time soft, and is lying against the hard one, becomes covered with a shell, and when laid presents a flat or crooked side, the result of its position against the hard one.

To over-feeding is also due the further irregularity of one perfect egg being found within another. This is caused by irritation of the oviduct, which, contracting in front of the perfectly-formed egg instead of behind it, forces it back until it meets another yolk, when the two join and again become coated with the white and the shell, thus producing another wonder.

The internal fatness of a hen causes other eccentricities than those mentioned, including the apparently paradoxical feat of laying rotten new-laid eggs—this being a not infrequent occurrence. The egg, being unable to force its way through the fatty oviduct, is retained two or three days near the mouth of this organ, and, if a fertilised one, the heat of the hen's body tends to putrefy it, and when ultimately laid it is in an addled condition.

To other causes, but principally diseased organs, is due a departure from the normal in the way of colour. A hen which lays white or brown eggs, may on rare occasions produce one almost black, while at other times the egg colour much resembles the dark green of the emu's eggs, and in some instances the shells are rough, wavy, corrugated, or otherwise irregular.

Fowls from whatever cause producing any of the above misshapen or otherwise faulty eggs, should at once be got rid of, for although in some cases a reduced diet may bring them back to their normal production, still the slightest cause will frequently prompt the organs to their previous irregularities, the fowls thus becoming unprofitable members of the flock.

The Colour and Flavour of Eggs.

In some cities in both Great Britain and America, brown-shelled eggs are in favour ; in others white are preferred ; while in a large number of places in both countries, as in Australia, so long as they are fresh and of fair size, the colour of the shell is not questioned.

What are known as the Mediterranean breeds of fowls all lay white-shelled eggs. Occasionally amongst a flock of these there may be one which lays a tinted egg. This is due to some recent or remote cross with some of the Asiatic breeds. White eggs, as a rule, are larger than brown or tinted ones. Andalusians, Minorcas and Spanish eggs will usually average 2¼ ounces each ; Leghorns about, or slightly over, 2 ounces.

The Mediterranean breeds are termed non-sitters. Despite this, in almost every flock of them an occasional one goes broody, while at the Roseworthy, South Australia, Egg-laying Competition, the poultry expert says the majority of the Leghorn pens had specimens showing broodiness.

The Asiatic breeds and their crosses lay brown or tinted eggs, Langshans and Cochins the darkest in colour. A shade lighter are those laid by Orpingtons and Wyandottes. Game and Dorking produce ones faintly tinted or almost white.

Many who prefer the brown egg consider it richer than the one whose covering is white. Such is not the case ; the shell has no bearing on the contents. The colour of the yolk is the best guide. A fairly dark yolk usually indicates a rich egg ; a pale one a poor egg.

The flavour of the egg is governed largely by the food given to the hen. When fed largely on meat, the yolk is of a very dark colour, and strong in flavour ; and when the fowls are allowed to run at large amongst rank vegetation, the yolks will also be dark. When milk is largely used in the diet, the yolk is pale, and the white watery and less firm than that laid by a hen fed on grain.

If fowls are kept in confinement, and given a good variety of cereal foods, fresh green vegetables, some meat, grit, and pure water, and get exercise by scratching for their grain in some loose material, they will lay good quality, nourishing, full-flavoured eggs.

The Uses of Eggs.

There are many uses to which eggs are put besides being eaten. In many factories they are largely used, as well as in medicine for external and internal purposes. Medicinally they are seldom used in cases of fever, on account of their high nutritive value, but they are often prescribed in digestive disorders, because they pass through without tiring the organs, and furnish a restoring food. According to some physicians there is not a more delicate, more stimulating or more easily digested food; and they are much used during convalesence, forming the transition from the broth diet to the more substantial fare. In cases of diarrhœa or dysentery, when most drinks increase the disease, whipped white of egg, mixed with water and a little sugar, is excellent to slake the thirst of the patient.

A concentrated albuminous water is made from six eggs and a quart of water, and is a remedy in some cases of poisoning.

The white of egg is used externally as a soothing medium for burns, either alone or whipped with oil. When whipped with alcohol it is used as a dressing for bed sores.

In cases of fracture, the white of egg is used for soaking the bandages, thus binding them together and promoting knitting of the fracture. The white is also largely used in clarifying liquids, and in the preparation of household cements.

The yolk of eggs also serves in a number of medicines. The late Dr. Philip E. Muskett, Senior Resident Surgeon to the Sydney Hospital, in his "Book of Diet," gives the following recipe for the sick room:—

> Four tablespoonfuls of the very best brandy, the same quantity of cinnamon water, the yolk of one egg; and a quarter of an ounce of loaf sugar. Beat the yolk of egg and sugar together, and then add the cinnamon water and brandy. This brandy and egg mixture is one of the most palatable and powerful restoratives known, and often proves of incalculable benefit in debilitating, exhausting, and prostrating diseases. The properly prepared cinnamon water can be readily obtained from any chemist.
>
> For debility, exhaustion, and prostration when a powerful stimulant is required, egg cordial is recommended, to be made as follows:—Beat the white of an egg to froth, add a tablespoonful of cream and a tablespoonful of brandy.

The yolk of egg is used in some cases of cancer and dysentery, in poultices and various salves. Oil is extracted from the yolk, and is used a good deal in cold countries for chapped hands, for burns, and to prevent pox marks.

A great many people are amazed at the enormous importations of eggs into England, which, during 1911, amounted to over nineteen million great hundreds, valued at about £8,000,000 sterling. The best sorts came from Denmark, and averaged about 1s. per dozen; the poorer grades from Russia, which totalled 52 per cent. of the total, averaged 9d. per dozen.

England is considered the greatest egg-eating nation in the world, but it does not follow that the above quantities were all for consumption. A London newspaper lately stated that over 40,000,000 of the cheap imported eggs are used annually in the calico print works. Photographers' establishments use millions of dozens, and wine clarifiers 10,000,000 dozens. Bookbinders, kid-glove makers, leather finishers, and other trades, also use them in enormous quantities; indeed, the general public have but small knowledge of the magnitude of the quantities wanted for commercial purposes.

Size in Eggs.

Amongst some people there is an idea that the aim of poultry-keepers should be to increase the size of the eggs. Why this is so it is difficult to tell. The average size of a marketable egg is 2 ounces, or eight to the lb., and eggs of this weight, if fresh and selected to colour, will always fetch the top market price.

Some think that hens of three or four years of age lay larger eggs than those of under that age. Pullets' eggs (the eggs laid before a hen's first broodiness), or the first batch of eggs laid, are certainly smaller than the succeeding ones, but those produced at the second laying are usually the standard size which will be produced during the hen's life.

If a pullet commences to lay very early, say at five months, as some do, the eggs during her first laying will not be so large as those produced by one of the same breed which did not commence till seven or eight months of age.

A good deal has been written about methods of increasing the size of eggs. Most of them are impracticable. Take any unselected flock of Andalusians, Minorcas, or Spanish, and the eggs from them will be found averaging about 30 ounces to the dozen, or over 2½ ounces each. Those from a flock of Leghorns will usually average 2 ounces each, or 24 to the dozen. There certainly are strains of the above breeds which lay eggs slightly smaller or larger than the above, but the sizes or weights given are those which accompanied the breeds on their introduction to us, and they are the weights still. Were it otherwise, what monsters the ova of a common hen would be at the conclusion of even a dozen years'

The Quality of Eggs.

Any stranger arriving in Sydney and reading the commercial columns of the daily papers, would be puzzled at the various trade names given to eggs—new-laids, Norths, Souths, Railways, sometimes pullets egg, cold store, and duck. It is not so to the same extent in other States. In Adelaide, hen eggs and duck eggs are the only terms. In Melbourne, there are often two prices, 1d. to 2d. per dozen separating them, while in Queensland, there is often 3d. or 4d. difference.

New-laids in Sydney, are eggs mostly from suburban farms, and are brought to the auction rooms or Sussex-street twice a week; hence they are never more than four days old, although if kept a week they would still be qualified and classed as new-laids. They fetch the highest price. The quotations for this quality in the daily papers on 19th April, were 2s. 3d. to 2s. 4d. per dozen. The quotation the same day in Adelaide was 1s. 6d., a difference of 10d. per dozen in our favour. Melbourne price was 1s. 6d. to 1s. 9d.

Southerns and Railways are our next best. Souths are rarely graded to size, 3d. to 4d. per dozen usually separating them from new-laids. Norths are those from the Northern rivers, and are still lower than the above sorts, the difference in price being more pronounced in the summer months. The temperature often affects them on the journey to Sydney.

Pullets eggs usually fetch within 4d. per dozen of new-laids, and cold store ones in April and May, from 1s. 6d. to 1s. 8d. per dozen.

It will thus be seen that in some States, "eggs is eggs," *i.e.*, all of one quality, while here they are differentiated according to size, age, and place of production. The large bulk of the eggs which come to Sydney from Adelaide are what is known in the trade as weak or slack, which means that there is a thinness of the white. The yolk of a good egg should stand up firmly; those which flatten out when the egg is broken are of poor quality, which may be due to neglect in caring for the hens, or exposure to high temperatures. The white of a freshly broken egg should be thick like cream, and should appear fresh and glistening. When the white runs, the egg is a poor-quality one.

If eggs are kept in dark places, they deteriorate in flavour. If kept in the light, they lose quality, and absorb bad odours from vegetables, meat and other surroundings.

A few years ago a report came from the land of inventions that a patent had been granted to a chemist in that country, who had discovered a means of manufacturing the glairy white and fatty yolk, exactly as contained in the new-laid egg, and had also succeeded in producing a substance for the shell. The object was to turn out these "new made" eggs, like the newspapers daily, and duly dated. Nothing has since been heard of the discovery, so it is evident the new brand did not go down with the public.

The Methods of Packing and Selling Eggs.

Each country has its own way of disposing of the hen's product. In this State the bulk of the suburban eggs are graded into hens' eggs and pullets' eggs; the latter being those below 2 ounces in weight, the former 2 ounces or over. They are usually packed in 36-dozen cases with fillers, or when the quantities do not reach that number 18-dozen, or 12-dozen cases are used. They are sold weekly, by auction, at some city rooms, or to the wholesale produce houses in Sussex-street.

Eggs sent from foreign countries to England are packed in what are known as cases, or half cases. A case of eggs contains 12 long hundreds (1,440), or 120 dozen. The purchaser is charged for 11½ long hundreds only, the other 60 eggs in each case being the buyer's allowance. This is to indemnify the purchaser for any broken ones. Whether there are any broken or not there are always 60 allowed, but if the breakages are over 100 it means a claim, which must be made within three days of receiving them. The 12 long hundred cases measure 7 feet long, 2½ feet wide, and 1 foot deep. In the centre are two upright boards the same size as the ends of the case, thus making a twin case. In each end are packed 720 eggs, the advantage of the centre boards being that the case can be cut into two half-cases intact.

The Danes, Italians, Roumanians, and Irish use straw as packing, and Russia, Hungary, and Austria pack the eggs in fine wood shavings. The Italians have a system of putting the straw through a process of crushing that makes it more pliable. It is passed through rollers, flattened out, and then thoroughly dried.

English poultry-farmers send their supplies to market in all sorts of packages, large and small. Of late years, however, boxes with fillers, such as are in use in this State, are being more extensively adopted.

In the English wholesale trade—that which applies to importation—all the eggs are bought by weight, and are termed 15, 16, or 17 pounders, as the case mav. The 15-pounder egg is one that weighs 2 ounces, the long hundred (120) weighing 15 lb. A 2¼-ounce egg would weigh 17 lb. to the long hundred. The eggs are neither individually nor collectively weighed by the packers in the respective countries, those used to the business being able to grade them to weights sufficiently correct for the wholesale men, who in turn sell them to the grocers and other dealers, each weight having a separate quotation.

In America the usual trade case contains 30 dozens; they are sold at so many cents per dozen.

As an illustration of the trade in eggs done in Sydney, it may be stated that for the year 1911 one Sussex-street house sold over £50,000 worth of eggs.

Preserving Eggs.

Of all the products of the land, none lend themselves to holding over for a season with such mathematical accuracy of profits as do eggs. Cereals can be held for considerable periods without any serious deterioration, but there is no certainty that the markets will be any better at the end of six months than at the time of harvesting. The same applies to stock. To-day's market may be normal, but no one can tell whether at the end of six months prices will be higher or lower than at present.

Not so with eggs. For as long as we wish to go back in this or any other country, the late autumn prices per dozen will be from 250 to 300 per cent. higher than those of the early spring months; and this is one point wherein the poultrymen can and do score over other producers. When in spring the price for eggs is 8d. per dozen, the late autumn following they will be 1s. 10d. to 2s. per dozen. When, as in the past two years, the lowest for new-laids was 10d., the highest was 2s. to 2s. 3d.

This feature in the egg business has been, for a century or more, responsible for thousands of attempts being made, and hundreds of patents being actually granted, for the preservation of eggs—that is, the keeping of them over in an unimpaired condition from the plentiful spring time till the late autumn or winter, when prices are higher.

Of the various systems, the later one of cold storage is certainly the best; but for those far removed from cold-store rooms, or those near them with but small quantities, there are several formulæ of proved efficacy.

In connection with the preservation of eggs, there are still some theories, and later day ones, which have to be contraverted. The principal one, and one which periodically appears, is that eggs must be infertile, or, as one writer lately put it, "Eggs, to be preserved, should not be fertile. If taken from the pens where a male bird has been running with the hens, their preservation will not be so successful."

Were eggs not gathered daily, or allowed to lie in a nest exposed to the sun for a day or two, the fertile ones certainly would not give the best results; neither would the infertiles. Both sorts, however, had thorough trials during the years the Government conducted the cold stores at Darling Harbour, and in no instance was any difference found in the results. New-laid eggs, when stored, came out in six or eight months' time in excellent condition, while others, both fertile and infertile, came out of the rooms faulty, for the reason they were in that state when stored.

One other point in relation to the packing for preservation. According to some, the thick end of the egg should be uppermost; others consider that the thin end should be at the top. Experiments showed that, when the goods were of the same quality, it did not matter which end was up, and, at the present time, the bulk of those who store do not bother which end is uppermost.

In hatching, quite a number of breeders keep a certain end of the egg up, from the time it is laid till placed under a hen or in an incubator. This is but a theory also. Time after time the writer has had equal results, no matter how the eggs were kept, and, if we were to follow nature, the eggs should be placed on their side, this being the position the hen leaves them in the nest when laid.

In England the same theories exist, and in order to prove or dispel them, Mr. W. B. Green, poultry lecturer to the Harts County Council, England, conducted a number of experiments, and published his report in *Poultry* for 25th December, 1903. He found that fresh fertile eggs kept for seven months in water-glass, lime-water, cream of tartar and salt, and lime-water only, were as good as infertiles kept under the same conditions, and it did not make any difference which end was up.

To those to whom it is available, cold storage is the best egg-preservative. The custom is to use 36-dozen cases, with white cardboard fillers. The questions of temperature, humidity, and cleanliness, are the chief points in successful egg-storage. The temperature must not permit freezing, but water freezing point, 32° F., will not freeze eggs. Extended experience shows that 28° F. is the best. Eggs in the latter temperature will keep longer than at a higher figure. A regular temperature, with small limits, will give the best results.

Humidity is a subject that has not received much attention in relation to egg-storing. American experiments, however, show that this depends on the construction of the rooms, and the quantity stored. The brine-pipe system is considered too moist for the best results. At the same time, there have been very few complaints regarding this system. Eggs absorb odours, and to be safe in this respect other commodities should not be stored in the same room. It is said one of the handicaps to success in egg-storing in other states is probably due to the eggs being stored in kerosene cases.

Sydney firms, in order to keep their rooms and floors clean and sweet, each year, before the storing period, give them a generous coating of fresh lime.

The length of time that eggs can be kept in cold store depends largely on their condition when they enter it. Eggs laid early in the season, when the weather is cool, assuredly keep best, and, if well graded, packed properly, and transported carefully, will be of excellent quality at the end of nine months.

MANUAL OF PHILIPPINE SILK CULTURE.

By Charles S. Banks, Entomological Section, Biological Laboratory, Bureau of Science, Manila, Philippine Islands.

THIS book has been issued for the benefit of those who desire to study the question of entering upon the commercial production of silk in the Philippine Islands. The life history and characteristics of several varieties of silkworms are explained in detail, and directions given as to the procedure necessary in all stages of the work. The cultivation of mulberry trees, and harvesting and feeding of the leaves, are also dealt with. The book is illustrated with eighteen plates, and there are also diagrams of silk house and hand silk-reeling machine.

Mulberry trees and silkworms were first introduced into the Philippines by the missionaries in A.D 1593, but largely through lack of financial backing, the industry was eventually abandoned. In 1905, the Bureau of Science imported from Japan a number of eggs of the Japanese silkworm, which rears only one generation in a year, but it was found impossible to keep the eggs for the necessary period of ten months in the Philippine climate. Attention was then directed to the Bengal-Ceylon variety, which produces six or seven generations a year, but the silk from which is not quite so good. These were imported and found to thrive excellently, producing nine generations per annum in the Philippines. A hybrid between the two races of insects has been obtained, and has been bred for twenty-five generations.

The Eri silkworm, which feeds upon the castor-oil plant, growing as a weed all over the Philippines, has also been introduced from Ceylon. These are much more active and vigorous than the others, and do not require the same amount of extreme care. The silk is fine, white, very soft and of great brilliance, and the fabrics woven from it are said to wear for twenty years. The silk cannot be reeled, but is spun like cotton, wool, or other similar fibre, and by means of a special apparatus. The apparatus used by the Philippine natives for spinning cotton has proved excellent.

The Philippine law prohibits the importation of silkworms, eggs, cocoons, or moths except by the Bureau of Science. This is to guard against the introduction of disease. The Bureau is distributing eggs to persons in the islands who have food for the insects, and undertake to place competent persons in charge of them. The Batoc school will soon be furnishing thoroughly trained young women for the work.

This manual should prove interesting to those who still hope that sericulture will yet be an established industry in New South Wales.

Orchard Notes.

W. J. ALLEN.

JUNE.

Planting.—Where deciduous fruit-trees or vines are to be planted this season, it is best to start the work as early as possible, whether it be for refills in an established orchard, or the planting of a new orchard. The sooner now that any planting is finished the better will be the early root growth, as the roots start to throw out new growth in July. If the soil is dry, however, it would be better to defer the planting until after more rain falls ; but wherever there is sufficient moisture, this work should be pushed on to completion.

Plant only such varieties as have proved themselves suitable to the district, and only plant a few varieties. Wherever there are old growers in the district, it is well to be guided by them as to which they consider the best kinds of fruits to plant ; then choose the very best varieties of the respective kinds, as it is only the high-grade fruit which is worth growing.

Subsoiling.—Subsoiling is very essential before planting an orchard. My experience is that trees planted on land that has been subsoiled thrive better than on land that has not been subsoiled. If the whole cannot be done at once it might be done where the trees are to be planted, say in strips 6 to 7 feet wide, and the remainder may be done from year to year, so that the whole might be finished by the third winter.

Inter-pollination.—It is claimed by some that where they have blocks of only one variety of apples planted, the crops are not nearly so good nor so regular as when several varieties are inter-planted. Bailey, in his book on the principles of fruit-growing, says, with reference to inter-pollination :- -

> It is known that some varieties of fruits are self-sterile—that is, they are not fertile with themselves. This sterility may be due, as in the case of the strawberry, to imperfect (or unisexual) flowers, or, more commonly, to pollen which is impotent upon the pistils of the same flower. This infertility, or self-sterility, is largely a varietal characteristic, yet it is no doubt greatly modified by seasonal environmental conditions. It is probable that varieties may sometimes be self-fertile and at other times self-sterile.

There is very little positive knowledge concerning the inter-pollination of fruits, and no subject in pomology is in greater need of study. We chiefly know that the most productive orchards are usually those of many varieties, and that some varieties refuse to fertilise themselves. The safest practice, therefore, is to plant only a few rows, say three or four, of any one variety together, in fruits in which (like many apples and pears) sterility is often apparent.

Strawberries often lack stamens altogether, whilst others, like Crescent, have so few and such poor stamens that they are practically self-sterile. Ordinarily, there should be a row of a perfect-flowered variety for every two rows of pistillate or infertile varieties.

Pruning.—In large orchards, pruning may be pushed on with this month; otherwise there is no hurry until July. This important work should not be neglected if growers wish to get the best results. Judicious summer pruning, combined with the necessary winter pruning, will repay the grower handsomely for the labour incurred.

A complete treatise on "Pruning" may be obtained from the Government Printer, Sydney; price 1s., postage, 1d.

Weak Trees.—Mark all weak and diseased trees when pruning, so that these can receive special treatment.

Liming.—Many orchards would be greatly benefited by the application of lime, and the present is a very good time to apply same, so that it will have had time to act upon the soil before the spring manuring.

Fruit Fly.—In one or two districts there are still evidences of this pest, but owing to the rigid inspection and the compulsory destruction of all fallen and infested fruits, the damage caused by this enemy is greatly reduced.

Attention should be given to fences, buildings, implements, &c., to see they are properly repaired.

GOOSEBERRY CULTURE.

GOOSEBERRY culture in New South Wales has been mostly conducted in the cooler and higher levels of the State. Districts such as Goulburn, Batlow and Orange have proved eminently suited to their growth. The prices usually received are very high on the Sydney market. For quarter cases of first-class fruit the ruling price last season was 6s. per case: but in some years the fruit sells for only 3s. to 5s. per case.

Gooseberries may be propagated by cuttings of the previous year's wood. In the preparation of these some care is necessary to remove the buds from that portion of the cutting which is inserted in the ground. If this is not done the young trees are constantly throwing up suckers, which, if allowed to grow, soon rob the trees of their vigour.

During May or June, shoots of the previous year's growth should be taken of about 12 inches in length, and these should be planted deeply in a rich sandy soil, in rows 2 feet apart, with about 12 inches between the cuttings. They should receive the pruning during the summer growth, by having all buds rubbed off with the exception of the three top shoots, which should be allowed to grow to their full extent, and be pruned rather short when the leaves have fallen in the autumn. The young trees may then be planted where it is designed they shall fruit, the only after care necessary being that of occasionally thinning out the branches by cutting clean out where too thick, and removing all stem growths or suckers from the roots.

The varieties generally found suitable to grow in this State are Roaring Lion, Crown Bob, and Ploughboy. The distance apart for planting should be at least 8 feet each way. In preparing the ground for planting, the same care should be given as is necessary for fruit-trees.—W. J. ALLEN.

Agricultural Bureau of New South Wales.

(NOTES COMPILED BY E. HARRIS.)

Branch.	Honorary Secretary.
Bathurst	**Mr. J. McIntyre, Orton Park.**
Bonville	**Mr. H. B. Faviell, Bonville.**
Cardiff	**Mr. D. Straker, Cardiff.**
Carlingford	**Mr. D. K. Otton, Carlingford.**
Coreen-Burraja	**Mr. H. Vickers, Coreen.**
Cowra	**Mr. M. H. Reynolds, Experiment Farm, Cowra.**
Cundletown	**Mr. S. A. Levick, Roseneath, Cundletown.**
Dubbo	**Mr. T. A. Nicholas, Dubbo.**
Dunedoo	**Mr. G. E. Alexander, Dunedoo.**
Forest Creek	**Mr. W. Thompson, Forest Creek, Frogmore.**
Grenfell	**Mr. G. Cousins, Grenfell.**
Gunning	**Mr. E. H. Turner, Gunning.**
Hoxton Park	**Mr. E. Banks, Hoxton Park.**
Inverell	**Mr. W. A. Kook, Rock Mount, Inverell.**
Jiggi	**Mr. D. Gibson, Daru Farm, Jiggi.**
Katoomba	**Mr. C. Wooller, Oliva Park Farm, Katoomba.**
Keepit, Manilla	**Mr. J. B. Fitzgerald, Keepit.**
Kellyville	**Mr. T. Glasgow, Kellyville.**
Leech's Gully	**Mr. J. T. Weir, Leech's Gully, Tenterfield.**
Little Plain	**Mr. F. S. Stening, Little Plain, *viâ* Inverell.**
Lower Lawrence	**Mr. E. T. Cooney, Lawrence.**
Mangrove Mountain	**Mr. G. T. Hunt, Mangrove Mountain.**
Milbrulong	**Mr. O. Ludwig, Milbrulong.**
Nelson's Plains	**Mr. V. Schlaadt, Nelson's Plains**
Orchard Hills (Penrith)	**Mr. H. Basedow, Orchard Hills, *viâ* Penrith.**
Parkes	**Mr. John E. Russell, Parkes.**
Peak Hill	**Mr. A. B. Pettigrew, Peak Hill.**
Penrose	**Mr. L. Pieremont, Penrose.**
St. Mary's	**Mr. W. Morris, Queen and Victoria sts., St. Mary's**
Sackville	**Mr. C. H. Britten, Sackville.**
Spring Hill	**Mr. J. A. Henry, Spring Hill.**
Stockinbingal	**Mr. J. Neville, Stockinbingal.**
Tallawang	**Mr. J. E. Hansall, Tallawang.**
Toronto	**Mr. J. G. Desreaux, "Esmond," Toronto.**
Wagga	**Mr. G. H. Kelsey, "Coolroy," Wagga.**
Walla Walla	**Mr. H. Smith, Walla Walla.**
Walli	**Mr. A. V. Bloomfield, Walli.**
Wallendbeen	**Mr. W. J. Cartwright, Wallendbeen.**
Wyan	**Mr. C. W. Harper, Myrtle Creek Railway Station.**
Yass	**Mr. S. Mann, Good Hope, Yass.**

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a précis of any paper which may have been read and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Lectures and Demonstrations.

A number of lectures on veterinary subjects to be given by the Veterinary Surgeons of the Department, and demonstrations on pruning and grafting, with information on winter spraying, by Mr. J. G. R. Bryant, Assistant Fruit Expert, have been arranged as follows :—

Veterinary Lectures :

Grenfell, 11th June.
Parkes, 13th „
Peak Hill, 10th July.
Bathurst, 18th „
Spring Hill, 25th July.
Cowra, 7th August.
Inverell, 9th „

Orchard Demonstrations :

Carlingford, 8th June
Kellyville, 10th „
St. Mary's, 19th „
Orchard Hills, 20th „
Cardiff, 25th „ morning
Toronto, 25th June, afternoon
Walla Walla, 11th July
Penrose, 19th „
Gunning, 24th „
Yass, 25th „

Carlingford.

The First Annual General Meeting was held on the 18th March, when a resumé of the proceedings of the branch during the past twelve months was given. The following office-bearers were elected for the current year: Chairman, Mr. J. Neil; Vice-Chairman, Mr. G. Thacher; Treasurer, Mr. C. Franks; and Hon. Secretary, Mr. D. K. Otton. Regular meetings will be held on the Thursday nearest the full moon of each month.

Coreen-Burraja.

Arrangements are being made for Mr. Inspector Ross to deliver a lecture on "Wheat-growing."

Dunedoo.

Mr. Inspector H. C. Wilson will lecture on "Wheat-growing" on 24th June.

Forest Creek.

This branch of the Bureau is interesting itself in the establishment of a Farmer's Experiment Plot in the district, and has secured offers of land from several farmers for the purpose.

Gunning.

The Assistant Fruit Expert, Mr. Bryant, will visit the branch on the 24th July, and at some convenient orchard will give a practical demonstration on pruning and grafting, and advice concerning winter spraying.

Inverell.

The branch reports the occurrence of contagious abortion in the cattle of the district. A Veterinary Surgeon will, therefore, give a lantern lecture on the subject on the 9th August.

Jiggi.

A meeting of this branch was held on 4th April, and Mr. Dairy Instructor Balhausen gave an instructive demonstration in Milk-testing.

Kellyville.

The members have been seeking information as to the method of laying cast-iron on steel for ploughshares. Cast-iron (such as may be obtained from an old cast-iron saucepan or piece of guttering) may be used for laying on steel for ploughshares in the following manner :—

Break off a piece of cast-iron the size of the part required to be laid; get a sligh welding heat on the share, and heat the cast-iron a dull red. Anything hotter than thi will cause it to crumble. Then gently rub together, when the cast-iron will run on. Smooth with a wire brush or old file, and plunge into cold water to cool. In practice, it is only necessary to lay the cast-iron on the point, and the method outlined will be found much easier and better than the use of steel for laying.

At the regular monthly meeting on the 20th April, the President (Mr. H. Firth) gave an address on "Lemon Curing." He dealt with his own personal experiences and deductions, and was attentively and appreciatively listened to by a large number of members.

Small packets of Thew, Warren, Medeah and Huguenot seed wheat have been forwarded to several of the members for trial purposes.

An exhibition case of insect pests is being prepared for the branch.

The Assistant Fruit Expert will give a practical demonstration on the 10th June on pruning, grafting, and winter spraying, at an orchard to be selected.

Lower Lawrence.

A lantern lecture was recently delivered at Lower Lawrence by Mr. Dairy Instructor Chapman, on "Cattle and Dairying." A debate followed.

Leech's Gully.

At a meeting recently held at Leech's Gully, it was decided to form a branch of the Agricultural Bureau. Mr. G. R. Smith has been elected as President, and Mr. J. T. Weir, Leech's Gully, Tenterfield, as Honorary Secretary. The annual subscription has been fixed at 2s. per annum.

Little Plain.

In response to a request by the Honorary Secretary for a collection of sample of seeds, true to type, the Department has sent samples of 21 different varieties of wheats, 7 of oats, 4 of barleys, 2 of ryes, and 2 of field peas. It is the intention of the branch to place these in suitable glass jars, properly prepared to keep the seeds, and exhibit them in a suitable place. The practical educational value to be derived from such an exhibit will be great, as the farmer will be able to compare samples of seeds they purchase for farm crops with these, which are guaranteed true to type No doubt other branches of the Bureau will forward similar applications to the Department.

Mangrove Mountain.

A branch is being formed in this fruit-growing district, and Mr G. T. Hunt, who is Honorary Secretary *pro tem*, will be glad to hear from likely members.

Mr. J. G. R. Bryant, the Assistant Fruit Expert, will pay the branch a visit on the 29th August next, and will give a practical demonstration in pruning, grafting, and winter spraying.

Orchard Hills.

At the meeting held on 2nd May, a variety of subjects were discussed, such as the growing of potatoes, melons, and small crops. Information is being sought in regard to diseases in melons, and arrangements are being made for a lecture on poultry. A practical demonstration in pruning will be given by the Assistant Fruit Expert, Mr. J. G. R. Bryant, at an orchard in the district, on the 20th June.

A poultry lecture will be given during July by a Departmental Expert.

Peak Hill.

An endeavour is being made to arrange for a lecture on "Wheat" to be delivered on the 19th June, by Mr. H. C. Wilson, Inspector of Agriculture.

Penrose.

At the last meeting of this branch Mr. T. Hewson, jun., read a paper on "Co-operation." He instanced the disadvantages under which producers of the country labour in marketing their produce. He quoted the Western States of America, where four-fifths of the fruit grown is marketed through co-operative associations. In Colorado, Idaho, Montana, New Mexico, Oregon, and Washington, there were 70 such enterprises. The lecturer dealt upon the advantages to be gained by Growers' Associations purchasing large quantities of fruit cases, wrapping and lining paper, spraying materials, fertilisers, farm implements and machinery, &c., which could be retailed to the members at wholesale prices. The lecturer outlined a scheme of action for the formation of a Fruitgrowers' Co-operative Association, composed of a central body of management and district branches in all producing centres The most important work appeared to be to make the growers interested in such an organisation, and induce them to take shares, and promise to deal only with the co-operative concern in the sale of their produce and purchase of such articles as it may deal in. The scheme includes the formation of packing sheds in each centre, and then the orchardist could concentrate all his attention on the growing of his fruit, and leave the grading, packing, and marketing to the Association, feeling confident that such matters were in the hands of persons more competent to deal with them than himself.

A practical demonstration of pruning, grafting, and winter spraying will be given by Mr. J. G. R. Bryant, Assistant Fruit Expert, on the 19th July, at an orchard to be selected.

Sackville.

The first annual reunion of this branch was held in the local School of Arts last month. After the work of the branch during the past year had been outlined by the President, Mr. J. Asprey, J.P., about 75, including many ladies, sat down to supper. During the evening musical items were interspersed with speeches—instructive and amusing—after which dancing was indulged in until the early hours of the morning. The executive officers of this branch show their wisdom in combining instruction with amusement.

On the 26th April, Mr. R. Camerini read a paper on "Manures and how to Use them," which was followed by an interesting discussion.

Spring Hill.

Mr. Veterinary Surgeon Sanderson will lecture on "Foaling, and Mortality among Foaling Mares," on the 25th July.

At the meeting on the 4th May, information which had been supplied by the Department on "Smut in Wheat and its Treatment" was read by the Secretary, and provoked an instructive discussion. The members were in favour of and had practised the bluestone process, and although they had not supplemented its use by the lime-water treatment, they expressed their intention of trying it.

The branch is availing itself of the Department's offer to supply a specimen case of insect pests peculiar to the district, and it is now being prepared for them.

Tallawang.

At the meeting of the branch held on 27th day of April, the hon. secretary, Mr. T. Collins, tendered his resignation, and Mr. J. E. Hansall was elected in his stead.

Toronto.

Specimens of the three different kinds of fruit-flies common in New South Wales have been sent to the branch, for the information of their members.

A practical demonstration will be given at a convenient orchard on the afternoon of the 25th June, by the Assistant Fruit Expert Pruning and grafting will be demonstrated, and information given on winter spraying.

Walla Walla.

A fixture for May was a lecture on the 28th, by Mr. H. Ross, Instructor in Mixed Farming, on "On Different Varieties of Wheat and their Cultivation."

On 11th July, Mr. Bryant, the Assistant Fruit Expert, will give a practical demonstration on pruning and grafting.

Walli.

The picnic and social promoted by this branch in March last proved to be not only a social but also a financial success. The takings were £15 6s. 2d. and the expenses. £9 12s. 3d., leaving a profit of £5 13s. 11d.

The branch forward a neatly got-up book containing their rules.

The following new members have joined :—Messrs. A. Gould, G. S. B. Wood, C. Edgerton, J. W. Green, G. W. Rowlands, F. Lashford, W. Grauss, F. Smith, E. Bates, and G. Edgerton.

On the 4th May, Mr. J. Ditzell, Experimentalist at Cowra Farm, delivered a lecture on "Wheat Culture." There was an audience of from 50 to 60, many travelling long distances to be present. The lecture was illustrated by lantern slides, which showed some interesting views of crops on the experiment farms.

Wyan.

Messrs. W. S. Marshall, W. Bennett, J. Bennett, M. Sury, P. Sury, and H. Stein, have joined the branch.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

LUCERNE ON FLAT SUBJECT TO FROSTS.—"J.W." (Gilmore): Provided the land is turned up early, and the seed is sown in spring, after frosts are over, lucerne should do well. Other questions answered by letter.—GEO. VALDER.

ORCHARD CULTIVATOR.—"W.G." (March): If the machine required is for a large orchard, a two-horse, 9-tine springtooth cultivator should prove suitable, especially in ground of a loose nature. These machines are largely used throughout the orchard districts. In heavy, stiff soils, the Planet Jr. set-tooth cultivators are largely used. For single-horse work, machines known as single-horse cultivators may be secured.—W. J. ALLEN.

KILLING GREEN TIMBER WITH ARSENITE OF SODA.—"B.B." (Gunning): The best time to apply arsenic is in late autumn or winter. The fact that your trees were treated in January, and rain fell afterwards, may have caused a vigorous growth; also the arsenic, being old, may have been at fault. The matter was recently dealt with in the "Agricultural and Pastoral Notes" issued by the Department to country newspapers, and reprinted in this issue.—F. B. GUTHRIE.

SWEET POTATOES; ALSO CROSS-BRED PIGS. "K.L.": Yes, the tops or vines of the sweet potatoes may be fed to cows and pigs with safety. In many districts such animals are allowed to graze on the crops with satisfactory results.

With a cross-bred Berkshire and British Black sow, the Berkshire boar would be preferable to the Poland China, although either could be used. The reason for this is that it is not advisable to make too many crosses, and by using the Berkshire boar the number of crosses is reduced by one. In addition to this, the Berkshire would be the better to use if it is desired to produce baconers, but to get a better class of baconer I would recommend using the Tamworth for crossing.—GEO. VALDER.

FRUIT-GROWING IN JUNEE DISTRICT.—"M.E.S.": The site and soil mentioned should prove suitable. In and around the Junee district, summer fruits are turning out very profitable. The following varieties should prove suitable for planting:—*Grape-vines:* Ohanez (Almeria), Doradillo, Ben Cornichon, Black Champion, Waltham Cross; *Peaches:* California Cling, Elberta; *Prunes:* Prune D'Agen, Robe de Sargent, Giant Prune; *Plums:* Grand Duke, Angelina Burdett; *Almonds:* Paper Shell, Ne Plus Ultra; *Pears:* Bartlett, Packham's Triumph, Anna Nelis, Josephine de Malines. A leaflet giving information with regard to laying out, planting, and pruning young trees has been posted to you.—W. J. ALLEN.

APPLE-GROWING.—"T.M." (Pennant Hills): The most suitable time for planting apples is during the winter months of June and July, when the trees are dormant. The manures should be applied in August, just previous to the spring ploughing. Superphosphate is found a splendid manure for apple-trees. Red oil emulsion has been found the most effective treatment for woolly aphis. For white louse, swabbing the main limbs thoroughly with lime-sulphur solution is found to check the pest. Lime-sulphur in a concentrated form may be secured from Sydney merchants.—W. J. ALLEN.

HORSES' FEET.—"C.J.": From the conditions explained, it is rather difficult to arrive at any definite opinion as to what the affection of the draught horse's swollen foot might be. The probable cause of the swelling is an injury of some sort, such as from a violent blow or the tread of another horse. Should the swelling burst, the best thing to do is to squeeze out all discharge and wash out the cavity daily with a solution of 4 grains of Corrosive Sublimate to 8 ounces of water, by means of a glass syringe. If the swelling is hard or bony, it had better be blistered with either Stevens' or James' blister, which can usually be obtained from country storekeepers or chemists.

In connection with the second case—that of a horse with poor growth of horn on the feet—the best treatment would be to rub a mild blister round the top of each hoof, with the view of stimulating the growth of horn. Only two pasterns should be blistered at a time. There should be an interval of two weeks between blistering the first and second pair, and the horse should be tied up by the head at least forty-eight hours after each blistering, to prevent him injuring the parts with his teeth. In addition, the hoofs might be well rubbed with an ointment consisting of half mutton fat and half Stockholm tar, melted together and well rubbed in two or three times weekly. The blister to use in this case should consist of 1 ounce of Powdered Cantharides to 5 ounces of lard, mixed together by the application of heat.

For the horse with the brittle feet, as long a rest as possible should be given.—VETERINARY OFFICERS.

DISEASE IN TOMATOES.—"W.E.W." (Dorrigo): The tomato haulms are affected with the fungus disease known as Tomato Leaf Spot (*Septoria lycopersici*, Speg). The use of Bordeaux mixture during the early part of the season is the best treatment. Badly attacked plants should be carefully removed and burned. It is usual for the disease to commence on the lower leaves, and the infection increases with the development of the plant until little of the plant remains. The first spraying should be given a few weeks after transplanting, followed by two or three additional sprayings at intervals of about three weeks (depending on the weather). Do not use the Bordeaux mixture any stronger than about 3 per cent.—BUREAU OF MICROBIOLOGY.

SYPHON FOR DRAWING WATER.—"T.G.G.": From your sketch it is evident that you propose to deliver the water through 17 chains of piping of 1 inch diameter, under a maximum head of 8 feet. The whole of the initial power would be consumed by friction, and the water would only dribble through. Nothing smaller than a 1½ inch pipe would be of any practical use; but if you state the quantity of water you require, and also the range of head, the Public Works Department will let you know what diameter of pipe you should instal.

INJURY TO COLT'S FOOT.—"W.H.M." has a valuable colt, nearly 2½ years old, which caught its foot in barbed wire last October, and severed a small sinew. If the wound has healed, and the animal is not lame, he might gradually be brought into light work, and it is thought this could be done without any unfavourable results.—VETERINARY OFFICERS.

WEEVIL IN WHEAT.—"W.P." (Balranald): The sample of wheat forwarded has been damaged by weevil. Place the grain in an air tight chamber, and place a quantity of carbon bisulphide in a saucer on the top of it. The fumes will sink through the grain and destroy the weevil. If unable to place it in an air-tight chamber, sew a piece of cotton waste, soaked in the solution, in the top of the bags.—GEO. VALDER.

CORRECTION.

LIST OF FERTILISERS IN NEW SOUTH WALES.

SOME errors having occurred in the table giving the guaranteed composition and value of manures on the market for 1912 in the May *Gazette*, page 402, the following corrected figures are to be substituted for the previous ones. Lines 16 to 20 should read as follows:—

Manure.	Where Obtainable.	Guaranteed Composition.				Manurial Value.		
		Nitrogen.	Water Soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	£	s.	d.
No. 1 Superphosphate	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-st.	..	17·0	18·1	..	4	6	4
A1 "	" " "		20·5	21·5	..	5	4	0
Nitro-superphosphate	" " "	1·35	15·44	19·05	..	5	6	5
Bone Superphosphate	" " "	1·5	9·0	20·5	..	5	1	4
Marion guano ..	" " "	..	..	31·0	..	4	5	8

Department of Agriculture,
Sydney, 3rd June, 1912.

BULLS FOR SALE

AT BERRY STATE STUD FARM.

SHORTHORN.—Roan Pansy: sire, Royal Hampton X (imp.); dam, Forest Pansy; calved 3rd December, 1910; colour, roan. Price, **25 guineas.**

Forest Pansy is by Oxford's Forest King (imp.) from Australian Pansy. Australian Pansy is by Airy Knight II from Pansy IV (imp.). This strain has proved a good dairying one for several generations of cows. Forest Pansy yielded 5,785 lb. milk in forty-one weeks, equal to 272 lb. butter.

AYRSHIRE.—Sir Julian: sire, Auchenbrain Spicy Jock (imp.); dam, Lady Julian; calved 5th December, 1910; colour, brown and white. Price, **£15.**

Lady Julian, on first calf last year, yielded 3,525 lb. milk in thirty-two weeks on grass feed only. She gave 8¾ lb. butter the third week after calving.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Beaucaire's Baby: sire, Monsieur Beaucaire; dam, Rosey of Wollongbar; calved 28th March, 1911. Price, **£40.**

Confidence: sire, Royal Preel, by Itchen Preel from Hayes' Lily du Preel (imp.); dam, Faith, by Prince Souvia from Clatford Hopeful (imp.). Price, **£45.**

AYRSHIRES.—Pride of Wollongbar: sire, Jamie's Heir; dam, Vanity of C.; calved 12th February, 1911. Price, **£9 9s.**

MacDuff: sire, Jamie's Heir; dam, Auchen Rose; calved 29th December, 1910. Price, **£10 10s.**

AT GRAFTON EXPERIMENT FARM.

SHORTHORN.—Monarch: sire, March Pansy; dam, Rosie (Illawarra): calved 8th May, 1910. Price, **£10.**

H. C. L. ANDERSON, **Under Secretary.**

Government Stud Bulls available for service at State Farms, or for lease.

Breed	Name of Bull	Sire.	Dam.	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	....	.. ..	Berry	*
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (imp).	Wollongbar Farm	*
,, ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
,, ...	Royal Pansy ...	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp).	,, ,,	*
,, ...	Jamaica Jack ...	Sir Jack . .	Rum Omelette (imp).	Wollongbar Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie	Berry Farm ..	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ..	*
Guernsey ..	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Lismore	26 May, '12.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.). .	Lismore	31 July, '12.
,, ...	Sky Pilot ...	Prince Souvia ..	Parson's Red Rose (imp.).	Palmer's Island ...	15 Jan., '13.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Casino	16 July, '12
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	H.A. College, Richmond	*
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '12
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	Tweed River ...	'12 Aug., 12
,, ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	Calm Prince ...	Rose Prince (imp.).	Gentle (imp.).	,, ,,	*
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	,, ,,	†
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	Rookwood Asylum	23 Oct., '12.
,, ...	Lauderlad ...	Laura's Boy ..	Souvenir of Wollongbar	Casino	13 June, '12.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 Nov., '12.
Ayrshire ...	Jamie's Heir ..	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm.	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
,, ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.)	Bratha 4th .	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ..	Bathurst Farm ...	*

* Available for service only at the Farm where stationed † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1912.

Society.	Secretary.	Date.
Hay P. and A. Association	G. S. Camden	July 9, 10
Wentworth P., A., and I. Society	W. B. Crang	,, 17, 18
Deniliquin P. and A. Society	L. Harrison	,, 18, 19
Peak Hill P., A., and H. Association	A. Yeo	,, 24, 25
Condobolin P., A., and H. Association	A. Turner	,, 30, 31
Riverina P. and A. Society (Jerilderie)	J. Kennedy	,, 30, 31
Narrandera P. and A. Association	W. T. Lynch	Aug. 6, 7
Trundle P. and A. Association	L. Todd	,, 8, 9
National A. and I. Ass. of Queensland (Brisbane)	C. A. Arvier	,, 12–17
Coolamon A. and P. Association	E. Owen	,, 13, 14
Forbes P., A., and H. Association	J. H. Bates	,, 13, 14
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 20, 21, 22
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Corowa P., A., and H. Society	J. D. Fraser	,, 27, 28
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 27–29
Northern A. Association (Singleton)	F. A. Bennett	,, 28, 29, 30
Ariah Park P., A., H., and I. Association	J. N. Taylor	Sept. 3, 4
Manildra P. and A. Association	C. M. Podmore	,, 4
Grenfell P., A., H., and I. Association	Geo. Cousins	,, 4, 5
Germanton P., A., and H. Society	J. S. Stewart	,, 4, 5
Albury and Border P., A., and H. Society	W. I. Johnson	,, 10, 11, 12
Young P. and A. Association	G. S. Whiteman	,, 10, 11, 12
Cootamundra A., P., H., and I. Association	T. Williams	,, 17, 18
Cowra P., A., and H. Association	W. T. Fisher	,, 17, 18
Wellington A., P., and H. Association	A. E. Rotton	,, 18, 19
Canowindra P., A., and H. Association	G. Newman	,, 24, 25
Ganmain A. and P. Association	J. F. Ashwood	,, 24, 25
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25
Temora P. and A Association	W. H. Byrnes	,, 24, 25, 26
Millthorpe P. and A. Association	R. H. French	Oct. 1, 2
Lismore A. and I. Society	T. M. Hewitt	Nov. 6, 7, 8
Tweed River A. Society	A. E. Budd	,, 13, 14

1913.

Albion Park A., H., and I. Association	M. A. Brown	Jan. 15, 16
Berry A. Association	C. W. Osborne	Feb. 5, 6
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 12, 13
Guyra P., A., and H. Association	P. N. Stevenson	,, 18, 19, 20
Central Cumberland A. and H. Association	H. A. Best	,, 21, 22
Southern New England P. and A. Association, Uralla.	W. McCrossin	Mar. 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 4, 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Camden A., H., and I. Society	A. Thompson	,, 5, 6, 7
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge	,, 11, 12, 13
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12, 13
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 26, 27
Cobar P. and A. Association	D. H. Dunlop	Apr. 5, 6
Moree P. and A. Society	D. E. Kirkby	,, 15, 16, 17

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FALLOWING IN THE NORTH.

1911 HARVEST.

Average yield on North-Western Slopes	8·52 bushels
Average yields on Farmers' [illegible]	[illegible] ,,
[illegible]	[illegible]
fallow [illegible]	[illegible] ,,

FALLOWING IN THE SOUTH.

1911 HARVEST.

Average [illegible] Western Slopes	.. 12·52 bushels
[illegible]	28·[illegible] ,,
[illegible]	25·6 ,,
[illegible]	[illegible] ,,
[illegible] Federation	
[illegible]	24·1 ,,

FALLOWING IN THE WEST.

1911 HARVEST.

Average yields Central Tableland - 10·74 bushels

Central Western Slopes - 10·14 bushels

[illegible] Federation [illegible] (short fallow) 23·5 bushels.

A. [illegible]LICK, GOVERNMENT PRINTER

VOL. XXIII. PART 7. JULY 2, 1912.

Agricultural Gazette of New South Wales.

The Improvement of Wheats by Cross-breeding and Selection.

AN OUTLINE OF THE WORK OF THE DEPARTMENT OF AGRICULTURE.

J. T. PRIDHAM, Plant-breeder.

It is sometimes thought that it does not much matter what variety of wheat is sown, provided that good cultivation and manuring methods are adopted. But the variations in soil and climate of this State are so great that the variety grown becomes of vital importance, and it is here that the Department of Agriculture has endeavoured to step in and assist the farmer.

It is hardly necessary to draw attention to the great achievements of the late Mr. W. Farrer, who possessed in a special way the patience, perseverance, and singleness of aim necessary to work of this kind. His varieties are well known throughout the State, and his methods were followed by Mr. G. L. Sutton, now Wheat Commissioner of the West Australian Department of Agriculture. Wheat-breeding is still proceeding on the same lines, with the Experiment Farm at Cowra for headquarters, which were set out in a letter of the late Mr. Farrer, dated May, 1899 :—

> I am engaged in an effort to make varieties or strains of varieties to suit all the districts of our interior . . . . and to produce grain which in grading can be placed in either the one or the other of two classes—
>
> 1. Varieties with all the characteristic excellences of the very best of the old South Australian sorts, but yielding stronger flour ;
> 2. Varieties which are equal to the very best grown in Minnesota or Manitoba in flour strength, but with mellower grain and of better appearance.

Basis of Improvement.

All efforts to improve plants are based upon their inherent tendency to vary ; but if it were not also true that "like begets like," the breeder would have small hopes of making any advance. The variation, however, is limited in extent, and with regard to any quality in which a variety is variable, the great majority of the plants fluctuate about a mean. A few possess the quality in a high to very high degree, and a few possess it in a small to very small degree. This is known as Quetelet's Law, which he illustrates by comparing the heights of 1,000 men of the same race. If ranged in line from the shortest to the tallest there will be a few very short and a few very tall individuals, the rest presenting but slight differences in height.

Objects.

To improve existing varieties and, where necessary, to produce new sorts better adapted to the needs of different districts than the varieties now grown there. This can be done by (1) selection alone; (2) cross-breeding followed by selection.

(1.) Professor Perkins, Principal of Roseworthy Agricultural College, South Australia, thus describes this method :—

> If we take up any wheat with a view to improving it, the time will never come when we shall be able to set it aside, under the impression that it had come so near perfection as to be beyond any danger of future backsliding. We recognise that, as soon as we take our eyes off a wheat we have been endeavouring to improve, as soon as we sell it to somebody else, so soon will it begin falling back with ever-increasing momentum towards the old dead level of mediocrity.

(2.) By cross-breeding and selecting from the varying progeny of the cross, a wheat may be secured of more stable characteristics than it is possible to obtain by selection only. Take, for example, Comeback, the result of crossing Improved Fife by Fife x Indian x Indian. No amount of selection of Improved Fife would produce so early maturing a variety as Comeback, though a certain degree of earliness in its progeny could be secured by selection alone. This would be, however, only a temporary or fluctuating improvement, which would be lost in a few seasons. But by mating Improved Fife with a variety containing three-quarter Indian blood, the early ripening qualities of the Indian are combined with the high milling qualities of the Fife parent in one variety—Comeback. This wheat will vary as to its milling value according to the character of the season, but will always tend to produce strong-flour grain which ripens early. While selection is necessary in order to keep the variety up to a high standard of yield and quality, and although, when left to itself, it would "go back" and fluctuate about an average, the original characteristics which marked it out as "Comeback" would remain.

SELECTION.

This is by far the most important part of wheat-breeding. The breeder must have a thorough knowledge of varieties and their behaviour under different circumstances and relationships.

Selection is sometimes understood to mean the grading out of shrivelled, defective, and small grain. While it is important to use full-sized plump seed for sowing, it is far more necessary that such seed should be produced only by prolific plants.

The individual plant is thus taken as the basis of all improvement, and in our stud or breeding plots it is laid down as a rule of the greatest importance that selected plants must be kept separate. Seed of a number of the best plants of any variety is planted in separate plots or rows, and at harvest time the row which yields best, and of which the grain is of satisfactory apparent milling quality, is reserved for next season's planting. Some of the plants marked for selection in adjacent rows of the same variety might be quite as prolific as the best plants in the row of highest average yield, but the prepotency of these is doubtful, and the row of highest average yield is taken as showing the greatest power to transmit the high yielding qualities of its parent plant. It is advisable to grow two strains of any given variety, in order to be sure of having seed which is prepotent with respect to milling quality as well as yield.

Limitations of Selection.

It is found that it is best to have a main objective, and to avoid attempting too much at once. For example, one might have in view the three characteristics of early maturity, exceptional grain quality, and high yielding power in a single wheat. If equal prominence be given to each of these in selecting, the probability is that the result will be a variety of indifferent value; because yield of grain, grain quality, and early maturity cannot be secured in high degree in one variety. The peculiar needs of each district, and the varieties to be improved for its conditions, will determine what quality is to receive most prominence; but the above-mentioned are required more or less in every wheat district.

Other qualities which come under consideration for improvement or elimination are:—

Weak straw;
Shaking out grain;
Presence of beards;
Liability to disease;
Susceptibility to drought.

An "all-round" or general purpose wheat is not a reasonable proposition. Most farmers grow two varieties, and some more than two; it is impossible to obtain a variety which will give the best results under any circumstances.

CROSS-BREEDING.

The aim of crossing is "to combine the desirable qualities of two or more varieties or species into one strain, and the elimination of undesirable qualities"; also to infuse new vigour into a variety by crossing two strains of that variety.

It takes much longer to fix a cross between wheats which belong to two distinct groups than between those which are of the same group. We are in the habit of using related wheats in crossing, and only resort to violent crossing, or the production of hybrids, when the quality sought for is not present in sufficient degree in a variety of the bread-wheat group. Although the best immediate results are obtained by crossing closely related wheats, the greatest success is often secured by the occasional use of parents from widely differing groups. This involves composite crossing, and the initial variations found are very great. This method is employed, *e.g.*, to reduce the tendency of a wheat to shake, or to induce rust-resistance. An illustration is afforded by the case quoted by Darwin of a successful breeder of greyhounds who, finding that his dogs were lacking in pluck and endurance, crossed them with a bulldog; and although it took several generations to recover the true greyhound type, his breed had improved in courage for the chase.

Fixing Cross-breds.

Cross breds are fixed in the districts for which they are likely to be suitable, so that, of the variations which arise, those which succeed well under the local conditions of climate may be preserved. It is impossible to fix a wheat for the Wagga district, for instance, at the Hawkesbury Agricultural College, where the conditions of growth are quite different.

Natural Crossing.

Although wheat is a self-fertilised plant, cases of natural crossing are met with from time to time. It is extremely rare in cold climates, but several instances have come under my own observation, and Mr. H. Howard, M.A., F.C S., reports five cases as having occurred at Lyallpur, India. Mr. H. Pye, Principal of Dookie College, Victoria, has also met with a number of natural cross-breds ; so that it is necessary in our climates to carefully "rogue" the wheat plots every year to keep the varieties pure.

Spontaneous Variations or Mutations.

These have occasionably been discovered on searching field crops, and we have usually found them to breed true. Steinwedel and Dart's Imperial have probably arisen in this way. It is not always possible to say whether a variation is due to mutation or to cross-fertilisation. Variations in Federation wheat in 1909 were sown in pure cultures, and came true to type next season. Fresh selections were made from a field crop again in 1910, and these also bred true.

Races of Wheat used in Crossing.

Of the *bread-wheat* class (*Triticum vulgare*)—

The Fifes or Manitoba varieties, which yield grain of high milling value, stool well, with tall straw of medium strength, but are late-maturing wheats.

The Indians, as a class, are very early, hold their grain, have short weak straw, and usually produce grain which is hard but of good bread-making qualities.

The Purple Straw or Australian type, yields well, producing a weak flour of excellent colour and texture.

Of the *club wheats*, often regarded as a separate race, *T. compactum*, the chief useful qualities are great yielding power, stiff straw, and grain-holding qualities.

The following races are employed to a limited extent :—

T. durum, or the macaroni wheat class, noted for its drought and rust-resistant qualities.

T. Spelta, or spelt wheat, which holds its grain tightly, is prolific and hardy, but has brittle heads.

T. dicoccum, or emmer, holds its grain well and is drought and rust-resistant.

Records.

An accurate system of records is indispensable to work of this kind, to enable pedigrees to be traced to their source, and to detect variations and departures from type which may arise.

A "Nomenclature Record" card is employed to describe the morphological and economic characters of varieties. These records are also useful for purposes of identification.

A "Planting Index" card gives the name of the farm, the field, number of row, or plot, in which the wheat is grown for the current year, and particulars of source and disposal of seed.

It might be thought that experimentalists in different parts of the State, having their own notions of the type required for their respective districts, would select in course of time new varieties differing but slightly and bearing the same name, to the perplexity of the farmer. But with regard to botanical characteristics, no special type is aimed at—so long as a cross-bred has no field defects, and is better than the variety usually grown in the district in some respect, the type would be fixed. When fixed, however, the botanical marks are carefully noted.

The F1 and F2 generations of cross-breds are grown at the Experiment Farm at Cowra, and seed of the F3 generation likely to succeed in another district is sent to be fixed at the Experiment Farm representative of that district. When a cross-bred has become fixed, it is given a number coupled with the name of the farm, and, if found suitable for more extended cultivation, it receives a name. Such fixed cross-breds are grown also at Cowra for comparison, so that any duplication of names may be avoided.

A summary of the subject of inheritance and crossing may be here given* :—

1. Organisms are composed of numbers of characters which are inherited as units. These units are inherited by definite laws, of which Mendel's is the first to have been discovered. Since these characters are inherited as units, it is most reasonable to suppose that each one has been originated, fully formed, as a mutation The addition of a new unit character is the only real difference between this mutating organism and its progenitors . . . .
2. The object of hybridisation is to shuffle and recombine these unit characters. Hybridisation, therefore, actually produces nothing new. Just as chemical units—the elements—can be combined and recombined into different compounds, so can the unit characters of organisms be combined and recombined by hybridisation.
3. The value of selections of fluctuations is slightly to increase, or decrease, the manifestations of a unit character after it has been formed by nature. Selection can never produce a unit character, for there is obviously no basis upon which it could work.

Mendelism.

Professor Biffen, of Cambridge, has made use of Mendel's laws in the fixation of his cross-breds, but we find in our composite crossing that there are so many different pairs of characters entering into combination that Mendelism provides no short cut to the desired end. Whether the individual plants selected will reproduce themselves faithfully can only be determined by selection from year to year. Where a single pair of characters only is to be dealt with the desired type could probably be fixed in the third generation by an application of Mendel's laws; but we have not found them of practical use, and it generally takes six years, and often eight, to fix a cross-bred. The initial operation of crossing is very simple, but it is only the prelude to a course of selection demanding considerable patience and judgment.

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* Dr. E. M. East, Bulletin 158, p. 93, Connecticut Experiment Station, 1908.

SPECIAL QUALITIES SOUGHT.

Yielding Capacity.

> "While directly the biggest thing to the practical man, it is, after all, not distinct quality in itself, but is the combined result of a number of qualities acting indirectly, and often not thought of at all."*

For example, Federation is a heavy yielder in most parts of the State, but is not suitable for the New England district, becaure of its cold wet climate; nor for the country west of Trangie, because of the very dry conditions found there. Again, Steinwedel is extremely prolific, but on account of its tendency to shake out its grain at harvest, often yields actually less than some other varieties.

Quality of Grain.

Where ordinary selection to increase the yield is carried on, without regard to quality, the result is that the grain becomes deficient in gluten and the best bread-making qualities.

Good milling quality of grain is usually indicated by a horny, translucent appearance, though analysis by means of a testing mill is the only really safe guide to the value of a variety in the bakehouse. The weight per bushel is not an indication to be relied upon.

It was recognised that a definite standard for quality in wheat should be fixed, and in consultation with Mr. F. B. Guthrie, the Departmental Chemist, a standard of 47 was adopted; and generally speaking any wheats below this figure are not recommended by the Department. A wheat with a flour strength of 47 would take up 47 quarts of water per 200 lb. bag of flour when being made into dough for baking. It is found that flour below this strength does not contain enough gluten to make a sufficiently nutritious, well-risen, and palatable loaf.

Rust-resistance.

Varieties which resist rust (*Puccinia graminis*, or summer rust) have been successfully raised, and, while it is recognised that a commercial variety cannot be made immune to attack, wheats have been produced, *e.g.* Thew and Warren, which so far resist the disease that a plump sample of seed is produced in a year when the grain from other sorts is pinched and light in weight. It is found, however, that such varieties tend to lose their rust-resisting powers after being grown in the field for some years, and it is necessary to breed new varieties to take their place, or to keep up the rust-resisting quality by selection, which is not always possible in the absence of rusty seasons.

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* M. A. Carleton, Cerealist, U.S.A. Department of Agriculture, "The basis for the improvement of American wheats."

Plants with a dark, glaucous green foliage colour and rather narrow leaves are likely to be most free from rust, while those with pale green, broad, limp leaves are most liable.

Drought-resistance.

A plant of medium to sparse stooling capacity, with stiff, erect, rather narrow leaves, is better able to fill its heads with good grain in a dry season than a heavy stooler with abundant foliage.

Early maturity.

This quality is of the greatest importance in our climates, where hot winds sometimes come before the crop is ripe. Early maturing varieties usually give a greater weight of grain than those that ripen late, in spite of the fact that fewer heads are produced; and the grain is always a better sample in a dry season than that harvested from late wheats.

Bunt-resistance.

By thoroughly infecting grain with spores of bunt or ball smut, and selecting each season the bunt-free individuals, it was hoped that a variety immune to disease might be isolated. Eleven years' experiments in this direction have resulted in the production of Cedar, which is highly resistant but not immune; and Florence, which is a little less bunt-resistant than Cedar. The latter is not sufficiently profitable to be grown except in a very few districts which suit it. Florence succeeds well in some districts, but tends to shake out its grain; and curiously enough, this defect has been found associated with a high degree of bunt-resistance in most of the cross-breds submitted to the bunt test. Certain varieties are more susceptible than others to bunt, but as the disease can be so readily prevented by the use of a suitable seed pickle, and as the measure of success attained is comparatively small, this section of the work has been much curtailed.

The ideal sought for, with due regard to the particular needs of each district, is an early maturing wheat which stools moderately, having erect glaucous leaves of medium breadth, and producing grain which is of sufficiently good milling quality and satisfactory yield.

LAST SEASON'S WORK AT THE EXPERIMENT FARMS.

Cowra.—Early-maturing varieties, as is usual, did best at Cowra.

A number of Purple Straw-Fife-Indian cross-breds appear likely to develop into good varieties, but nothing has been found of sufficient value to include in the Field Variety trial this year except "Wagga No. 21," which has done well in the Stud plots here.

A very early maturing cross-bred, which appears to be fixed, and has a brown head, is being transferred to Nyngan. It comes into head at least a week earlier than Federation at Cowra, ripening about the same season as Bunyip.

A number of crosses were made, and some variations in standard varieties, selected in the field last year, will be tested this season.

Wagga.—Mr. R. W. McDiarmid, the Experimentalist, reports that the early-maturing varieties were badly damaged by a severe hailstorm on 29th September, just when the wheats were in head. This storm materially interfered with the year's results. On account of the patchy nature of the storm, and the fact that midseason to late varieties escaped damage, it was impossible to make accurate comparisons.

Several cross-breds which have proved highly resistant in the extensive bunt-tests carried out at this Farm, are now being grown in the Stud Variety trial, to determine their comparative yielding qualities.

A number of hybrids between Federation wheat and a two-rowed barley (Federation being used as the mother) have been tested in the mill, and the large percentage of flour produced has been equal to Federation in strength and gluten content, and is of excellent colour. The straw of these varieties, however, is weak; but it is hoped that this defect will be improved by cross-breeding and selection.

A new cross-bred, "Wagga No. 21," which has a French wheat for its mother, the other parent being a Fife-Indian variety, has been this year put into the Field Variety trial for testing on a larger scale. It is nearly as early as Federation, with a white, slightly-tapering head, yields well, and has good straw, but tends to shell. In the mill it is about equal to Federation.

Zealand, and the more recent variety, Firbank, are both in favour in the district, and they have been sown in adjacent rows in the Stud plots for the last four years. Firbank has out-yielded Zealand in each case, except last year, when it fell a victim to the hailstorm along with the other early-ripening varieties.

A few crosses were made, chiefly with the object of correcting a tendency to shell, noticed among some of the bunt-resisting cross-breds.

Bathurst.—From Mr. J. W. Shaw, the Experimentalist, the following notes will be of interest:—

The most promising cross-breds for the district, which now appear to be fixed, are:—

(1) Wagga No. 19, which has a brown ear, rather like Federation, and is of French-Fife-Indian parentage, yields flour of good colour, but not superior to Federation in strength.

(2). A cross-bred, which is a half sister to Florence, has proved highly bunt-resistant, and is a good hay and grain variety. It yielded more grain last season than the other new sorts. The ear is white and smooth, similar in appearance to White Lammas. The straw is of good length and green to the foot.

(3) Wagga No. 22 is a promising wheat which is being grown for the first time in the Field Variety trial. It is rather a weak-flour wheat, but yields well and seems to suit the district. The ear is medium open and white in colour.

(4) A cross-bred, in whose pedigree White Lammas and Jonathan figure largely, has done well as a bunt-resister, yields satisfactorily, and is suitable for hay.

Several others are mentioned as promising; the midseason wheats such as Cleveland, Rymer, Yandilla King, Genoa, and Jonathan succeed best at this Farm.

A large collection of cross-breds was submitted to bunt test, but the experiments this season will include only the best of these, and any which are likely, from their breeding, to become resistant.

Glen Innes.—The season was such as to favour the early and to some extent the midseason wheats. Late varieties produced no grain at all, or else a very pinched sample. Mr. H. Bartlett, the Experimentalist, says that crosses on Cedar wheat have done well. Cedar is too hard to thresh, but it has been crossed with Florence, and the progeny, now in its fourth generation, yielded well last season. The grain threshed fairly easily, and was plump and of very good milling quality. Three or four other cross-breds seem promising, but are as yet unstable in type. In consequence of the dry season, little or no rust was found.

Cedar last season was crossed at Cowra with the late maturing variety Haynes' Blue-stem, which does well in this district, but is very liable to shell. The combination should make a useful wheat for Glen Innes.

Three new cross-breds are promising enough to be grown in a Field Variety trial this year. The first is a Fife cross-bred mated with Early Lambrigg, and the second a French-Fife-Indian cross-bred. Both varieties are more suitable for hay than for grain.

The third, Hermitage, is a cross-bred variety, originally from the Hermitage State Farm, Queensland. It has done well as a grain producer, and is being grown this year in the Field Variety trial. A milling analysis of this wheat showed a flour-strength of 47, so that it belongs to the "Soft White" class.

Late frosts are not uncommon, and in an average year midseason wheats succeed best, such as Jonathan. Varieties of this type are being selected for the district, and these require to be rust-resistant. The Cedar cross-breds appear to suit the local conditions well.

Hawkesbury Agricultural College.—Mr. Donnan, the Experimentalist, secured some fine samples of grain, the past season being unusually favourable for wheat at the College. Thew and Warren were most free from rust, a slight attack of which was noted. The macaroni wheats and their cross-breds are most free from rust, but several "bread-wheat" cross-breds are very promising in this respect. Two in particular, with long pedigrees, mainly of the Fife-Indian character, are now almost fixed. These are prolific, early ripening, and yield a plump sample of grain. Wheats of the macaroni type, such as Medeah, are best suited for silage.

Although it was not a rusty season, Mr. Donnan has kept records of the degree of rust observed on each variety and cross-bred, so that breeding for rust-resistance will not receive a check.

Nyngan.—From Mr. E. Baring's report it appears that it was a fairly good season last year at Nyngan, and rust did no damage to the crops. As might be expected, the early ripening wheats gave the best results, Firbank showing most promise. The Experimentalist noted the following cross-breds as having done well; they are as yet quite unfixed:—

- Cedar x American Prolific (a wheat similar to Steinwedel).
- American Prolific x Comeback.
- Bobs x Cedar.
- Bobs x Dexter.
- Alpha (nearly pure Purple Straw) x Federation.
- John Brown x Sunset (a cross-bred containing Purple Straw blood largely).

The wheats which suit the climatic conditions here are those which stool sparingly and are moderately well clothed with narrow stiff leaves. Steinwedel stands drought well, but stools a little too freely and makes too much flag. We hope to have some interesting results from this Farm in a few years. Last season is the first time stud wheats have been grown at Nyngan.

New Wheats.

We do not anticipate being able to supply any of these till 1914, when seed of Wagga No. 21 will be available for farmers, as well as small parcels of three or four other varieties. When a wheat is fixed it is grown in the Field Variety trials at such Experiment Farms as are likely to suit it, but the seed harvested is only enough to sow areas on these Farms for the supply of seed to farmers the following year.

TAPIOCA BAGASSE FROM JAVA.

MESSRS. LINDLEY, WALKER & CO., grain brokers, Sydney, have supplied the Department of Agriculture with a sample of Tapioca Bagasse, which they understand is used for cattle-feed, especially for milch cattle, in Java, and there is a desire to introduce it on this market.

Mr. F. B. Guthrie, Chemist of the Department, has analysed the sample, and furnished the following report:—

	Per cent.
Moisture	6·38
Ash	1·34
Fibre	9·63
Albuminoids...	1·75
Ether extract (oil)	0·83
Carbohydrates	80·07

This is a very starchy feed, with only small proportions of fat and albuminoids. It would need to be mixed with substances such as bran or oil-cake, to balance it. The nearest approach to a feeding stuff of similar composition is afforded by rice, which has 79 per cent. of carbohydrates (starch) and 0·4 per cent. of oil; but this contains more albuminoids (7·4 per cent.) and less indigestible fibre (0·2 per cent.).

The Chondrometer.

VARIATIONS IN THE REGISTRATION OF THE WEIGHT OF WHEAT PER BUSHEL.

H. V. JACKSON.

THE arrangements for arriving at the Fair Average Quality of wheat in New South Wales have from time to time been adversely criticised by the farming community, and considerable discussion and inquiry has also taken place in Victoria and South Australia on the same subject.

The Sydney Chamber of Commerce has been sufficiently enterprising to instal one of McGuirk's Patent Weighing Machines for the purpose of weighing the bushel measures of wheat, with the object of arriving at the average weight per bushel of average quality wheat. This machine registers from 1 lb. to 2 lb. and over above the weight registered by some, if not all, chondrometers, and divergence in the weighings per medium of the chondrometers is so frequent and remarkable, that probably some of the dissatisfaction among farmers on the disposal of their wheat arises from this cause.

When I was present at the Chamber of Commerce on Thursday, 1st February, 1912, as one of the representatives of the New South Wales Government on the striking of the F.A.Q. standard of wheat for the season 1911-12, the following records were obtained in connection with twenty-six different wheat samples:—

Sample No.	Weighed per McGuirk's Machine.		Chondrometers.				
			A	B	C	D	E
	lb.	oz.	lb.	lb.	lb.	lb.	lb.
1	61	15½	60	60	59¼	....	.....
2	62	12	61½	61	60	......	...
3	61	14¾	60	60¼	60¼	....	.....
4	61	8½	59¼	59½	59½	.....	59
5	61	13	60¼	60	59¼	....	61
6	62	4	60½	60	60	.....	60½
7	57	11¾	55	59½	54½	.....	56
8	54	15¾	51½	51	50¼	50½	......
9	62	1½	60½	60½	60	60½	....
10	61	8	60	60¼	59	59	......
11	62	3¼	60	60¼	59¾	59½	......
12	61	1¾	59	60	59	59¼	.....
13	63	13¼	63	63	62¾	62¼	.....
14	62	11½	61	61	60¾	60½	61¼
15	62	2¼	60	60	60¼	60	60½
16	62	12	61	61¼	61	60½	61
17	63	0¼	61	61	61	60¾	61¼
18	60	10	59	59	58	58¼	59½
19	63	5½	60	60½	60½	60½	61
20	60	5¾	59	59½	59¼	.....	59½
21	63	1½	61	61	61¼	.....	61
22	62	5	60½	60½	60¼	......	60¼
23	63	1¾	61	60½	61½	......	62
24	62	2¾	60	60½	60	......	60¾
25	63	0	.....	60½	60¼	......	60½
26	62	10½	60	60½	60¼	..	61½

It will be seen from the respective weighings that the five chondrometers on the table seldom, if ever, all agreed, and were frequently differing in their respective weighings.

While these diminutive approximate bushel-weight measures may not be all tuned to the same exact scale, it may be at once admitted that a great deal also depends upon the manner in which each individual "strikes" the grain level in the bucket before weighing.

Under all the circumstances it appears to be most unsatisfactory that farmers and others dealing in immense quantities of grain, should not have something more reliable than chondrometers, whereby their grain value in weight can be estimated. For the protection of grain sellers, there should be some means of having chondrometers tested and gauged to weigh in reasonable agreement with McGuirk's weighing machine, and the chondrometers when tested and proved should be stamped and certified.

A Sydney firm recently submitted to the Department a chondrometer which is constructed in such a manner as to more nearly approximate with McGuirk's weighing machines. Reporting on this instrument, Mr. Guthrie, Chemist of the Department of Agriculture, says, "This is the best type of chondrometer I have met with." The following weighings of some of the samples in taking the F.A.Q. standard show how it compares with the standard (McGuirk's), and with the ordinary chondrometer which we use at present:—

Average Samples.	Weight in McGuirk's Scale.		Department's Chondrometer.		German Chondrometer.	
	lb.	oz.	lb.	oz.	lb.	oz.
F.A.Q. (1912)	61	13¼	59	10	62	0
Western	61	2	59	4	61	6
Northern	60	10	59	0	61	3
Southern	62	10½	60	8	62	8
Bobs (F.A.Q.)	65	10¼	64	0	65	8
Comeback (F.A.Q.)	65	7¼	63	12	65	2

The instrument is thus very much closer in all cases to the standard scales used by the Chamber of Commerce when striking the F.A.Q. standard of wheat. The strike is much more accurate, and successive weighings agree more closely amongst each other. The instrument is slower in its operation than the ordinary chondrometer.

PARALYSIS OF HORSES AND CATTLE.

In the South Australian *Journal of Agriculture* for May, the Government Veterinary Surgeon (Mr. J. F. McEachran), states that considerable mortality, with symptoms of paralysis, has occurred in horses in various parts of the State, but chiefly north of Adelaide, and he attributes the trouble to some poisonous agent in fodder chaff. It is intimated that the nature of the causative agent will be sought for laboriously. A similar trouble is reported from Victoria. The mortality occurs mainly in the summer months.

Our Natural Pastures.

NEED FOR IMPROVEMENT.

E. BREAKWELL, B.A., B.Sc., *Economic Botanist.*

THE wool industry, combined with that of dairying, produce one-half of the financial wealth of this State. In other words, on the pastures of New South Wales have depended very largely in the past, and must to a considerable extent in the future, the prosperity and development of the country.

The main factors which have brought about such a state of things are:—

(*a*) Nature has bestowed on New South Wales a very considerable area of good soil, and most nutritious, palatable grasses, salt-bushes, and other fodder plants ;

(*b*) These natural pastures, under ordinary conditions, can produce the finest sheep and the finest wool in the world ;

(*c*) Our pioneers have been enabled, in the past, to command very large tracts of country, and to avoid overstocking.

These factors are excellent ones on the credit side. We have, however, acting as deterrents to continued and uninterrupted prosperity, the following disadvantages :—

(*a*) Given drought conditions our natural pastures fail us, with enormous financial loss to the grazier and to the State :

(*b*) These same drought conditions, combined with overstocking, are unmistakably killing out our grasses, and particularly our salt-bushes ;

(*c*) The age of very large estates is dying, and closer settlement is encouraging overstocking, and not allowing recuperation of pastures.

Droughts cannot be avoided, but the disastrous effects of drought can be minimised by conservation of fodder. The necessity for such conservation is self-evident. The grazier has no cause to complain if he will not attempt to conserve, in good seasons, the munificent natural feed that Nature has given into his hands. The conservation of fodder would also prevent, to a large extent, the cutting down of fodder plants in drought time, and the eating out of salt-bush.

The main purpose of this article, however, is to show how the greatest amount of good may be obtained from our native grasses and fodder plants. The writer is convinced that our pastures can be considerably improved.

What is Required.

To achieve the best results, we require:—

(*a*) To determine the best grasses for typical districts;
(*b*) The laying down and cultivation of the best grasses;
(*c*) The judicious selection of the best mixtures;
(*d*) The periodic resting of grass paddocks.

The Best Grasses.

Some of the factors which go to make a good grass are palatability, succulence, drought-resisting qualities, perennial habit, and free seeding propensities. The two first factors, palatability and succulence, are influenced, to a large extent, by soil and situation. While Kangaroo grass, for example, may prove to be extremely palatable and nutritious to stock in the coastal districts, it does not follow that this will be the case with the grass in other districts. On the Northern Tableland, and in some of the western districts, it becomes harsh and unpalatable. As a matter of fact, one must take as his best guide, not the chemical analysis of the grass, but the partiality of stock for it, its fattening and milk-producing qualities, &c.

Again, some grasses stand out prominently above others in dry seasons. The writer has seen, during the last season, after three months' absence of rain, such desirable grasses as Australian millet, Spider grass, *Panicum effusum,* Windmill grass, and Weeping Love grass quite green when other vegetation was completely withered. The grasses just named are all free seeders, succulent, and palatable to stock. Surely they are worthy of every encouragement.

Cultivation.

Having determined the best grasses for typical districts, the laying down of areas with these grasses is the surest method of improving the pastures. Just as dairymen in the coastal districts have been induced to lay down artificial pastures like Papsalum, Rhodes, and English mixtures, so could the landholder of the interior considerably benefit himself and the State by encouraging the best grasses in his vicinity.

There is no necessity, in most cases, for employing artificial mixtures. Even in the Coastal districts, where the climate favours artificial mixtures, it is doubtful whether the natural pastures of the Hunter River and other areas are not superior in feeding qualities to artificial pastures. There is plenty of material at hand in every district, be it the coast or the interior, for the farmer and grazier to work on. New South Wales possesses grasses like Kangaroo, Wallaby, Blue, Love, Panick, and Mitchell grasses, which probably could not be replaced or surpassed in any way.

Mixtures.

There may be seen on uncultivated land in Singleton district a mixture of succulent native grasses, comprising Sugar-grass, *Panicum trachyrachis, Panicum effusum, Panicum flavidum,* Cotton Panick, Queensland Blue-grass and Australian millet, which form a pasture that would be hard to excel by any artificial pasture in the world. There is every probability that a mixture of a large number of native grasses could be employed, as nearly all possess tufted habits, and do not spread like Paspalum, or Rhodes. One can hardly imagine the excellent and palatable pastures which a judicious mixture of native grasses could produce, especially under cultivation.

Resting of Paddocks.

If the grass paddocks could be rested at periodic intervals for the purpose of harvesting seed, opportunities would be given for the recuperation and extension of the pastures. At the same time, the subdivision of a pasture would enable a farmer or grazier to determine definitely the best fattening and nutritious grasses.

Need for Co-operation.

To achieve the best results the co-operation of farmers, dairymen, and graziers is necessary, and is cordially invited, for, with this co-operation, mutual benefit will ensue to the State and to the individual. If those interested would kindly answer the following questions, preliminary steps towards improvement could be taken:—

(1.) What grasses or other forage plants furnish the greatest amount of feed during the year in your locality? If you do not happen to know the names of such grasses and fodder plants, are you willing to provide samples so that steps can be taken to name the same?

(2.) If the condition of any part of your estate is unproductive, do you attribute it to overstocking, drought, or both combined? Please explain why.

(3.) Will you please state the largest number of cattle and sheep which, in your opinion, have at any time grazed on any particular area with which you are acquainted, and at what time? What do you estimate is the present carrying capacity of the area?

(4.) Provided the Department should be able to furnish seed, would you be willing to put it in the ground in proper shape in some favourable situation on your place, where cattle or sheep will not graze it for at least one year after planting? A very small patch would be required, say 50 feet square. Such an experiment would enable us to determine what forage plants are best adapted to your locality.

Answers to these questions from different districts would save a great deal of time, and would pave the way for a systematic method of procedure in improving our pastures.

Kindly address replies to the Under Secretary, Department of Agriculture, Sydney.

The Frozen Meat Trade.

THE Minister of Agriculture is in receipt of a communication from the Agent General, London, on the subject of the frozen meat trade in the United Kingdom and on the Continent, in which he says:—

The following statement shows the quantity of mutton and lamb imported into the United Kingdom during the past two years, together with the country of origin:—

Country of Origin.	1910.		1911.	
	Mutton.	Lamb.	Mutton.	Lamb.
	carcases.	carcases	carcases.	carcases.
Australia...	2,722,453	1,496,559	1,962,008	1,649,043
New Zealand	1,991,123	3,416,347	1,795,738	3,428,045
South America	2,838,678	515,048	3,058,687	1,066,663
Total	7,552,254	5,427,954	6,816,433	6,143,751

The feature of the trade during the year was the increase in the quantity of lamb and the decline in the quantity of mutton imported. The import of lamb into the United Kingdom during 1910 was 5,427,954 carcases; this was increased during 1911 to 6,143,751 carcases, or by 715,797.

The import of mutton, which in 1910 was 7,552,254 carcases, fell away in 1911 to 6,816,433, or by 735,821 carcases.

As regards country of origin, South America improved its position considerably during the year, having increased its trade with the United Kingdom by 220,009 carcases of mutton and 551,615 of lamb, whereas the Australian trade showed 760,445 fewer carcases of mutton, and 152,484 more of lamb, and the New Zealand trade showed a decrease in the export of mutton to the extent of 195,385 carcases, and a slight increase in the export of lamb.

The monthly distributions of the Australian trade is shown below; the figures denote arrivals in England:—

Month.	Mutton.	Lamb.
	carcases.	carcases.
January	359,836	601,314
February	342,396	246,957
March	193,068	110,863
April	88,089	64,242
May	73,501	30,258
June	64,899	32,853
July	99,132	15,927
August	163,369	11,365
September	152,583	27,489
October	114,941	12,328
November	103,790	97,639
December	206,210	397,808

The arrivals in the early part of the year were heavy, but Australian mutton was the cheapest then available, and was taken for consumption fairly freely.

Towards the end of the year a large quantity of Australian mutton and lamb reached England; but the carcases, especially of lamb, showed a very wide divergence of quality. The proportion of carcases of choice quality was very small, and a great deal of the lamb from New South Wales was inferior. Doubtless the dry weather experienced in many parts of the State towards the end of the year accounts for the condition of the meat.

Four of the Australian States sent meat to the United Kingdom, the non-exporters being Tasmania and Western Australia. The number of carcases received from each State during 1910 and 1911 is shown in the following table:—

State.	1910.		1911.	
	Mutton.	Lamb.	Mutton.	Lamb.
	carcases.	carcases.	carcases.	carcases.
New South Wales ...	1,394,316	394,977	1,162,183	415,730
Victoria	488,407	859,655	467,900	1,072,393
Queensland	700,564	22,462	306,679	13,571
South Australia... ..	139,166	219,465	25,246	147,349
Total	2,722,453	1,496,559	1,962,008	1,649,043

It will be seen that there was in the case of each State a decrease in the quantity of mutton exported. The decrease in the case of New South Wales was 232,135 carcases; Victoria, 20,507; Queensland, 393,885; and South Australia, 113,920. There was a decrease in the quantity of lamb exported in the case of three of the States, viz., New South Wales, 20,753 carcases; Queensland, 8,891; and South Australia, 72,116. Victoria, however, showed an increase of 212,738 carcases, so that in the total there was an Australian increase of 152,484.

Beef.

The quantity of chilled and frozen beef imported into the United Kingdom during 1911 was 4,466,104 quarters, as compared with 4,246,182 in the preceding year, showing an increase of 219,922 quarters. The countries of origin of the 4,466,104 quarters imported during 1911 were as follows:—

	Quarters.
Australia	521,382
New Zealand	165,546
South America	3,674,876
United States	104,300

The Australian beef brought to the United Kingdom was 16,028 quarters less in 1911 than in 1910. Queensland was the only State that maintained its trade, having an increase of 24,420 quarters on the year; New South Wales showed a decrease of 18,231 quarters. No beef was sent to England during the year by South Australia, and very little by Victoria.

The quality of the beef sent last year from Australia to the United Kingdom was very much better than in the preceding year, and this improvement was especially noticeable in regard to Queensland produce.

The following table gives a summary of the Australian beef exports during the past two years:—

Exporting State.	1910.	1911.
	quarters.	quarters.
New South Wales	40,810	22,579
Victoria	19,318	1,068
Queensland	473,587	498,007
South Australia	3,967	....
Total	537,682	521,654

All except 1,309 quarters of the total shipments in 1911 were frozen. There was only one shipment of chilled beef during the year; this was from Queensland. The chilled cargo met a very bad market, and the shippers did not care to repeat the experiment. There is an impression in the London market that the duration of the voyage from the East Coast of Australia to England is too long for chilled cargoes; but it is altogether too early to pronounce a definite opinion on such a matter.

Australian Meat for the Continent.

In view of the efforts that have been made from time to time during the last six years to induce the Continental Governments to allow the import of frozen meat into their dominions, a statement of the present position and prospects of the business may not be without interest.

It will be remembered that the Cold Storage Congress met in Vienna in the month of October, 1910. Almost immediately thereafter the embargo on frozen meat was so far removed that the importation of a specified quantity was permitted, and the authorities of Vienna asked to be allowed to take 800 tons, and some seventy other cities made known their anxiety to share in the privilege of importing. The Austrian Government was bound by its agreement with Hungary, and the agrarian interests of the two countries, making common cause, procured the revocation of the proclamation allowing the introduction of frozen meat, and on the 30th June last an edict was issued prohibiting the further import of this class of produce. This was modified subsequently to the extent of allowing the entry of cargoes afloat at the date of the edict, and this interesting experiment came to an end. During the few months the prohibition was removed, 5,000 tons of frozen meat were imported into Austria. The whole of this quantity came from South America.

Italy appears to be in a better mood for encouraging the introduction of frozen meat, and, in spite of a fairly heavy duty, good business has been done. South America has again been the principal shipping country, but a few consignments from Australia have reached Genoa and Naples.

The Italians speak favourably of the Australian beef, and it is understood that more business would result if there were less difficulty in obtaining freight.

It will be remembered that until quite recently there was a total prohibition of the importation of frozen meat into Switzerland. That country, during a great part of the year, is maintained by the expenditure of tourists, the country, so to speak, being a large hotel of many proprietors. So, years ago, with the concurrence of the Government of the time, I made strong representations in favour of the total prohibition being removed, and my representations were backed up by the Board of Trade and presented to the Swiss Government by His Majesty's Ambassador at Berne. One of the points taken against the Swiss Government was the absurdity of allowing preserved meat, sausages, and the like to enter the country on the certificate of a veterinary surgeon, while frozen meat was prohibited. The total prohibition was removed in January, 1909, and frozen meat admitted with certain requirements in July, 1909. I do not expect a satisfactory trade to arise, as the regulations restricting imports are likely to be vexatiously multiplied, as every Canton in the country may impose its own regulations over those of the Federal Council in the event of the agrarians obtaining a majority.

France has so far made no announcement in regard to the remission of duty, although a great deal of interest was evinced during the year on this subject. It is stated, however, that South America proposes to renew shipments of frozen meat to France at an early date.

Opposition is still offered by the German Government to the importation of frozen meat, but vigorous representation will again be made during the year, and it is thought that the barrier will soon be partly removed. The opposition takes the form of the same so-called sanitary law which operates in Switzerland, and which requires that carcases must have lungs, heart, &c., naturally attached, and that there must be certificates of the immunity of the exporting country from cattle disease, attested before the German Consul, and veterinary examination before and after death at place of killing. There is a further examination required at the port of arrival and at place of sale. The Colonial certificate is required to state the colour of the beast from which the meat came. In spite of this regulation, which is obviously intended to be prohibitive, a cargo consisting of 100 carcases of Australian frozen mutton has just been imported into Germany by Messrs. Lohmann & Co., of Bremen, acting in conjunction with Messrs. W. Weddel & Co., Limited, the latter shipping the meat from London to Bremen to the first-named firm. Half the parcel was sold in Berlin and half in Chemnitz, after the numerous difficulties in regard to Customs requirements, inspection, &c., had been overcome. The shipment aroused much interest in Germany, as at present no dead fresh meat is imported from America and other distant meat-exporting countries, owing to the difficulty of complying with the sanitary requirements above indicated. However, as has been said, the difficulties were surmounted in this particular instance, and the meat has given satisfaction wherever sold in Germany. This importation, however, was not on a sufficient scale to test the possibility of the German restrictive regulations being complied with to any large extent, and the decision on this point is still in suspense. I understand that great endeavours are being made by the Argentine Government, through their Ambassador in Berlin, to get Argentine meat into Germany, the prospect of a reciprocal commercial treaty with reciprocal duties being held out as an inducement to Germany to give preference to Argentine meat.

Speaking generally of European countries, I fear that they are all impervious to external pressure in the matter of the removal of trade restrictions. There are many thousands of workmen in all the great industrial countries who rarely taste fresh meat; it cannot be supposed that this condition will last for ever, and when the barriers against the importation of frozen meat are broken down it will be by pressure from within.

As regards the trade with the United Kingdom, the prospects for 1912 are considered by those who are in a position to judge to be very satisfactory from the Australian point of view. Storage rates in London were advanced by 7½ per cent. during the year as a result of the strikes, but an effort is being made to secure a revision of the charges. Considerable increase has taken place in the storage accommodation in London, and the Port of London Authorities propose to erect new stores at Smithfield.

THE SUB-PACKER IN SOUTH AUSTRALIA.

In the South Australian *Journal of Agriculture* for May, results are given of experiments conducted for four years, on plots of 3 acres each, by Mr. T. Griffin, of Hammond, to ascertain the effect of various methods of cultivation in districts with scanty rainfall. Federation wheat was grown with 60 lb. superphosphate per acre. The following were found the three best methods:—

Method of Treatment.	Average Yield for Four Years.	
	bus.	lb.
1. Disked, ploughed 6 inches deep, immediately sub-packed, and thoroughly surface-cultivated during the summer.	21	40
2. Disked, ploughed 6 inches deep, thoroughly surface-cultivated during the summer, but not sub-packed.	19	8
3. Disked, ploughed 6 inches deep, thoroughly surface-cultivated during the summer, and sub-packed before sowing.	18	12

Three other plots were treated similarly to these, but only ploughed 4 inches deep. The yields were 18 bus. 15 lb.; 16 bus. 6 lb.; and 16 bus. 2 lb. respectively. Two other plots were ploughed in the autumn, 4 inches deep. One was sub-packed and averaged 14 bus. 57 lb.; the other was not sub-packed, and averaged only 13 bus. 41 lb. The average annual rainfall during the four years was 9·93 inches.

Hand-feeding Sheep at Wagga Experiment Farm.

On Christmas night, 1911, a shower of 60 points was received at Wagga. On Sunday, 9th June, 1912, a violent dust-storm was followed by monsoonal rains registering a little over an inch. Between those dates there was no rain in sufficient quantity to be of any practical use, the total being 101 points.

These rains of the second week in June were general throughout the State, and from the Queensland border to Albury there was a feeling of gratification at the breaking up of the long dry spell. It is proposed now to place on record the methods which were used at Wagga Experiment Farm to prevent mortality in sheep during the drought, in the hope that they may be of use to farmers and pastoralists in preparing for the repetition of these dry periods; for our experience teaches that as surely as the sun rises every morning, we shall have droughts again.

Fortunately for the results, the Farm went into the drought without being overstocked. The number of sheep on the property—a mixed farm of 3,200 acres—was only 734, excluding this season's lambs. These sheep, however, had a value to the State far in excess of what they would bring in the market at any time, for they comprised, in addition to the stud flocks, the animals with which a long series of experiments are being conducted, to determine the breeds most suited to the Riverina country, for wool and mutton and the production of early lambs. Any serious losses would have meant that the whole of the experiments would have had to be commenced again, at the risk of destruction by another drought.

The stud flocks include twelve rams of the English Leicester, Dorset Horn, Shropshire, and South Down breeds, as well as sixty-one ewes of these breeds. All ram lambs from these are kept for transfer to other Experiment Farms, and sale to farmers.

For the experiment work there are 200 Merino ewes, which were mated with rams of the Lincoln, English Leicester, and Border Leicester breeds. As the result of previous crossing, there are 197 first-cross ewes—Lincoln-Merino, English Leicester-Merino, and Border Leicester-Merino. These in turn have been mated with Dorset Horn, South Down, and Shropshire rams, to test the capacity of the crosses for the production of early lambs. There are also 68 first-cross ewes for mating next season: and a number of wethers and wether lambs kept for testing purposes for wool and mutton.

From these details, it will be seen that the loss of any considerable number of the sheep at Wagga Farm would have deprived the district and the State, for some years at least, of valuable experimental results. Nevertheless, the means taken to pull them through the drought were not more expensive than those which many flock-owners have adopted, knowing, after the experience of 1902, that they would prove profitable.

In ordinary seasons, of course, no hand-feeding is done at the Farm. In 1902, 1906, and 1912, hand-feeding has been adopted to a considerable extent, and in 1910 a little silage was given, as green pasture was scarce. In 1902, 80 per cent. of the lambs were saved, which more than returned the cost of the feed, besides saving ewes which would otherwise have had to be replaced. The experience gained in that year and in 1906 has been turned to good account this year.

About four years ago, when the growth of barley grass in a young lucerne paddock was excessive, some 400 tons of material were put into a combined pit and stack silo. About one-third of it was barley grass, and the balance lucerne and trefoil—rather more lucerne than trefoil. The pit was dug to a depth of 4 or 5 feet, and timbered, and the stack, when the silage was compressed, extended about the same height above ground.

In 1910, the silage was broken open, and 400 flock ewes were given a little every second day, for six or eight weeks, on account of the absence of green feed. The quality of the material was then proven, and when the recent drought commenced it was used without hesitation. It was found that the flavour of the lucerne had gone through the barley grass, and the whole is eaten readily. If left exposed too long, however, the heads of the barley grass turn dry, and the awns are just as objectionable as when the grass is fresh.

The stud Dorset Horn ewes receive 30 lb. beeswing chaff between twenty-seven sheep, together with 2 oz. of dry grain per head per day. They have also a little picking on an old lucerne paddock.

The other stud ewes, Shropshires, South Downs, and English Leicesters, are being supplied with 1 lb. of second hay chaff, 1⅓ lb. of pie-melon, and 1 lb. silage per head per day. They run on an old stubble paddock, which, however, has been pretty well exhausted by previous feeding. The sheep are very fond of the melons, and seem to thrive well on them and the additional fodder.

The Merino ewes are given about 3 lb. silage, and 1 lb. second hay chaff per head per day. It may be necessary to give them a little better class of hay chaff, unless the frosts keep away sufficiently to let the barley grass grow quickly after the recent rains.

The cross-bred flock ewes receive 3¾ lb. silage, and about ¾ lb. second hay chaff per head per day. As these are big sheep they require more feed than Merinos.

The dry sheep—first-cross ewe hoggets for mating next year; all tests of first and second crosses up to four-tooths; and stud ewe hoggets—are given 2 lb. of silage, and about ½ lb. second hay chaff per head per day. These do not require much feeding.

Up to the date of writing, the Dorset Horn ewes have lambed, and over 100 per cent. have been marked. The other stud ewes are expected to lamb towards the end of June. The Merino and cross-bred ewes are lambing now, and up to 10th June over 50 per cent. have been marked in both cases.

The losses, since mating, have totalled fourteen ewes. The bulk of these deaths have been from natural causes, and only one could be directly attributed to the ewe lambing when in poor condition. Five cases were Merino ewes carrying twins or triplets to sires of Long-wool breeds—a practically impossible task for a Merino ewe in a season like the past. The balance of the cases were those in which the ewe had a weakness, apart altogether from her feeding, to which she succumbed.

Since just before the ewes started to lamb, they have been given a lick of Liverpool salt, with 6 per cent. Epsom salts. This has helped the milk immensely, apart from its value in checking a tendency to impaction in the absence of natural pasture. In other dry seasons, when the lick was not provided, it was quite common for 15 per cent. of the ewes to lamb without milk at all—which meant that the lamb had to be destroyed, as it could not be added to another ewe in such a season. This year, all the ewes are lambing with a fairly good show of milk, though natural pasture is absolutely absent.

The Farm officers expect to be able to cease hand-feeding about the end of June, provided the weather keeps mild enough to allow the barley grass to grow after the recent rains. Should heavy frosts occur, however, it will be necessary to continue the feeding until about 1st August. At the present rate of feeding, there is sufficient silage left in the pit mentioned to carry on for a considerable time.

PIT SILAGE IN WESTERN RIVERINA.

MR. S. P. WILSON, Carrah, Jerilderie, wrote as follows to Mr. Inspector H. Ross, under date 25th May, 1912:—

> You will be pleased to know that the sorghum which I put in a pit upon your advice thirteen months ago has turned out a great success. I have been feeding 800 sheep and 30 head of cattle upon it for the past three weeks, and have still a week s supply. We shall then have to fall back on the tub silo, but that is not much more than one-third full.
>
> About 1 foot at the end of the pit, 6 inches at the sides, and 4 inches on the top, was damaged and black. The rest of it is a pale brownish colour, and in better order, all through, than the tub silage.
>
> I am well pleased with the experiment, and thanks to your advice, know what to do in future with any surplus sorghum.

An Object Lesson in Tuberculosis.

MAX HENRY, M.R.C.V.S., Government Veterinary Surgeon.

If the first of the photographs, with which this note is illustrated, is glanced at, it will be seen to show several apparently perfectly healthy calves. As a matter of fact, all these calves had reacted to the tuberculin test, and, when *post-mortemed*, were all found to be affected, some to a considerable extent. One was affected on the pleura, in the lungs, and in the bronchial lymphatic glands; a second in the lungs, bronchial and mediastinal glands; and the others in the mesenteric lymphatic glands.

The second photograph is the small intestine of a heifer about eleven months old, showing several glands badly affected. This heifer contracted tuberculosis by ingestion, that is by swallowing the bacilli of tuberculosis with the feed, and in all probability the milk on which the heifer was fed as a calf was responsible for the disease, although it is possible that she contracted it from feeding over pastures contaminated with the recently dropped fæces of tubercular animals.

These photographs illustrate one of the many methods in which tuberculin can be of the greatest service. Had these calves not been tested before being turned out with other young cattle, the chances are that they would have acted as distributors of the disease sooner or later.

One of the most economical methods of dealing with tuberculosis is undoubtedly to test the calves as they come off the bucket, and before they are put out into the paddocks, as in this way the farmer would be continually reinforcing his herd with healthy stock. For there is no doubt that a very fair percentage of animals become affected with tuberculosis while they are still calves, but show no symptoms for years after, although all the time they may act to a greater or less extent as centres of infection. The loss sustained by killing any calves which reacted would be far less than that sustained by killing adult cattle.

Sawdust and Stiff Soils.

A correspondent of the Department on the South Coast has a piece of land which is rather stiff and of a black clayey nature. There is a saw-mill in the locality, from which he can obtain any quantity of sawdust for the carting; and he asks whether it would be wise to apply a good coat of sawdust to his land and plough it in.

It is not advisable to apply sawdust in any quantity to land, as in decaying it would give rise to acid conditions which would prove very detrimental. A little sawdust could be mixed with superphosphate to render distribution easier, but care should be taken to see that the sawdust is well rotted.—Geo. Valder.

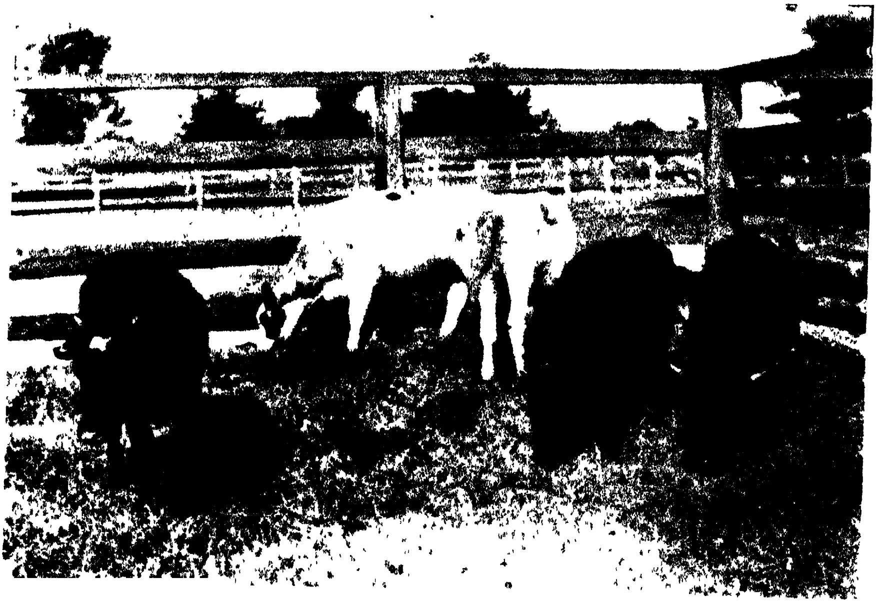

Fig. 1.—Apparently healthy calves which had reacted to the tuberculin test.

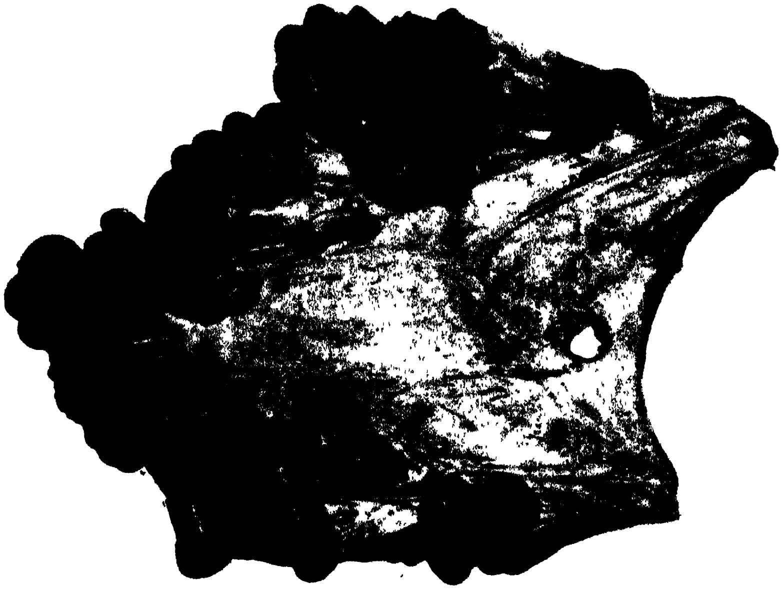

Fig. 2.—Small intestine of one of above calves, showing glands affected by Tuberculosis.

AN OBJECT LESSON IN TUBERCULOSIS.

Stink Grass (*Eragrostis major*, Host).

A GRASS WHICH PROMISES TO BECOME A NUISANCE IN NEW SOUTH WALES;

Together with some Notes on Odoriferous and Poisonous Grasses.

J. H. MAIDEN,
Government Botanist, and Director Botanic Gardens, Sydney.

THE grass is described and figured in Britton and Brown's *Flora of Northern United States and Canada*, 1, 189. It is described in Hooker's *Fl. Brit. Ind.*, vii, 320, as follows, and a very large number of synonyms are quoted :—

> *E. major*, Host., *Gram. Austr.*, iv, 14, t. 24; leaf margins (in Indian specimens) glandular, panicle oblong to ovate-oblong, stiff; branches subsolitary, spreading; pedicels very short; spikelets $\frac{1}{6}$ $\frac{1}{3}$ inch, ovate-oblong or linear, few to 50-flowered. empty glumes, ovate acute; rachilla tough; flowering glumes broadly ovate, subacute; palea broadly obovate, much curved; keels scabrid or ciliolate; grain globose.

Prof. W. J. Beal (U.S.A.) states that "the glands secrete a substance emitting an unpleasant odour, offensive to animals. It is of no agricultural value."

It has been confused with a common Australian grass (*Eragrostis Brownii*, Nees), which is very variable. Bentham writes, in the description of *E. Brownii*: "Spikelets always sessile, or nearly so." The spikelets are very conspicuously stalked in *E. major*, and one sometimes wonders how Bentham called the spikelets sessile, or nearly so; but it was placed with *E. Brownii*—it was believed to be Australian, and it could be placed with no other species in the *Flora Australiensis*.

It may be separated from *E. Brownii* by the more compact panicle, the ring of short hairs forming the ligule, and the glands (Hooker's *Flora of British India*), which look like blunt teeth on the margins of the leaves. Leaves broader and less convolute in *E. Brownii*.

For a figure of *E. Brownii*, see this *Gazette* for July, 1904.

Confusion of *E. Brownii* with this grass may be responsible for the depreciatory remarks concerning the fodder value of that grass, which will be noted on reference to the July, 1904, account of *E. Brownii*.

It is evidently closely allied to *E. costata*, F. Turner (*Proc. Linn. Soc. N.S.W.*, xxx, 91, 1905), which I have not seen.

Eragrostis major in Australia.

Professor Ewart writes in *Proc. Roy. Soc. Vict.*, xxiv, 65, May, 1911, noting it from Mooroopna, Goulburn Valley, Victoria :—

> This grass was recorded in the Weeds, Poison Plants, and Naturalised Aliens of Victoria (p. 94) as a garden escape. It has now evidently established itself, and may be considered naturalised.

Mr. F. Turner first recorded it for New South Wales in the "Abstract of Proceedings of the Linnean Society of New South Wales," 25th October, 1911.

Although only recently recognised, doubtless various observers have known it for a long time. Mr. F. Turner in recording it said that some years ago the late Mr. George B. Gidley King drew his attention to it as having then recently appeared at Goonoo Goonoo, Tamworth. He recorded it from north-west New South Wales, and Tamworth and adjacent districts.

Mr. E. Betche collected it at Manly, Sydney, in 1885, and the following specimens in the National Herbarium, Sydney, of later dates, show that it is widely distributed in New South Wales:—

Port Jackson.—"Its scent drew my particular attention."—(A. van Someren.)

Hawkesbury Agricultural College.—(W. M. Carne.)

Gulgong.—(J. L. Boorman and J. H. Maiden.)

Merrigoen, *via* Mudgee.—(F. H. Brown.)

Boggabri.—(W. R. Fry); also 20 miles south-west of Boggabri—(D. A. Porter.)

"I send you a specimen of grass which I believe will be a pest in this district within a few years. Nothing seems to eat it unless they are starved; and like all pests, it grows best on country which is heavily stocked."—(G. L. Dowe, Manilla.)

"It grows profusely on the property of Mr. C. R. Rose, of Cowra, but sheep refuse to eat it, though other food is not abundant."—(G. L. Sutton, Experiment Farm, Cowra.)

Springthorpe, near Forbes.—(J. M. M. Cooper.)

Minore, near Dubbo.—(J. L. Boorman.)

"Said to have a very obnoxious smell."—(Dr. Failes, Coonabarabran.)

"There is a good deal of it, but cattle will not touch it."—(Warren, New South Wales, through Editor of *Farmer and Settler.*)

"It goes to seed three times after being eaten down by horse or cow. I find it stands dry weather, but in moist ground it grows wonderfully.—(G. O. Wilson, Cookamidgera.)

The following are Queensland localities:—

Warra, Great Western Railway, abundant.—(J. H. Maiden.)

Warwick.—(J. L. Boorman.)

The Grass in America.

Introduced from Europe into the United States, where now it is a great pest. I give three representative opinions of it as regards the United States:—

Stink Grass.—In Kentucky while walking about cultivated ground, one is frequently reminded of the presence of this grass by the peculiar buggy odour it exhales. A weed, without any redeeming qualities.—(Kentucky, *Bulletin* No. 87.)

Stinking Grass is another of the weedy annual grasses. It grows in cultivated or waste grounds and in yards. When fresh it emits a strong, unpleasant odour. The seed is frequent in Timothy (*Phleum pratense*) seed.—(Ohio, *Bull.* 83.)

Stink Grass.—A low, spreading grass of gardens in the latter part of summer and during autumn. Although it is an attractive grass it is unpleasantly scented.—(Nevada *Bull.* 38.)

Not yet Investigated.

Now this malodorous property which causes animals to reject it for food means something. What is it? In other words, it requires to be investigated. Whether it contains a saponin, or prussic acid, or some essential oil distilled by the glands is unknown, and so far as I know, no European or American chemist has analysed it.

Other Odorous Species.

Following are references to the odours of other species of *Eragrostis*:—

Eragrostis Frankii.—A strong scented grass.—(Kentucky, *Bull.* 87.)

"*E. multiflora*, Forsk., or 'Stink Grass,' is coarse and weedy, and has such a disagreeable odour when fresh that animals do not relish it. This odour disappears on drying."—(South Dakota, *Bull.* No. 40.)

The above are from the United States, and the following is Australian:—

Eragrostis leptostachya, Steud.—"Gives forth a strong and very unpleasant odour; it is eaten by stock."—(A. R. Crawford, Walcha, March, 1898.) Mr. Crawford again speaks of it as "A most malodorous grass."

Dr. J. B. Cleland informs me that in the Port Jackson district he noticed that, when fresh, it has a sweet musky odour, not readily described. These two observations on the same grass need be by no means contradictory; they are at present inexplicable.

Eragrotis pilosa, Beauv.—Mr. A. R. Crawford, in the following note, draws attention to the perfume of this grass. I have not observed it myself, but Mr Crawford is a careful observer:—

> Citron-like perfume: In the morning, when the dew begins to dry off, the scent is very noticeable; in the heat of the day there is a strong perfume, but quite different from that of the morning. The scent is given forth like that from a flower. Rubbing between the fingers makes no difference, as with *Chrysopogon parviflorus*. It is unfortunate that the scent of the *Eragrostis*, strong when growing, fades at once when it is cut.

It is the fugitive character of the odours of grasses which has caused observers to mistrust their own observations. Again, there is a narrow boundary between what is known as a perfume and a stink. Sometimes a sweetly scented flower is known to become offensive in a day.

Odoriferous and Poisonous Grasses.

The subject of odoriferous and poisonous grasses is one of special interest to stock-owners, and the surface of it has been scarcely scratched in New South Wales. Little has, indeed, been done anywhere. Farmers and pastoralists would do well to systematically record observations.

In the following notes the paper by Greshoff is entitled "Phytochemical Investigations at Kew," by the late Dr. M. Greshoff (*Kew Bulletin*, 1909, p. 397).

A. C. Crawford, referred to below, is the pharmacologist of the Department of Agriculture of the United States, and his paper is quoted under *Stipa*. A. R. Crawford was for many years a valued correspondent of mine in the Walcha district, New South Wales, and I regret to hear of his death, which took place last month.

Some grasses have been described as narcotic, but may this not be the effect of hydrocyanic acid? The fact that some Coumarin-containing grasses have been reputed injurious is suggestive.

Some statements are of fact, *e.g.*, that certain grasses at certain seasons may develop hydrocyanic, *i.e.*, prussic, acid within their tissues, owing to the presence of a glucoside which induces the formation of this poisonous substance. But whether such a grass may be fairly stated at any time to be poisonous is another matter, and farmers and pastoralists must not be alarmed at the mere mention of the word "poison."

The pollen of certain grasses is said to bear some relationship to hay-fever in man.—(A. C. Crawford.)

Walsh[*], also, has recently claimed that some of the summer diarrhœas of infants are due to the injurious action of various grasses eaten by the cattle which supply their milk.—(A. C. Crawford.)

There are some reports, like those of Oserow,[†] in which grasses grown on a particular soil are said to be poisonous. The exact explanation of this is as yet lacking, but perhaps the injurious action may be due to some inorganic constituent which is taken up by the grass from the soil.—(A. C. Crawford.)

The following notes on grasses have been arranged in alphabetical order of genus names:—

Alopecurus geniculatus, L.—One of the "Meadow Fox-tail" grasses, causes some disturbance in animals, perhaps owing to Coumarin.—(A. C. Crawford.) Coumarin grasses are often recommended for admixture with hay, and even damaged hay, because they impart their pleasant odour, which is reputed to be appetising to herbivorous animals.

Andropogon, *Cymbopogon*, and *Vetiveria*.—See a very valuable paper entitled "The Oil-grasses of India and Ceylon," by Otto Stapf (*Kew Bulletin*, 1906, 297). These are genera of aromatic grasses, from which the Grass-oils of commerce are distilled.

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[*] Walsh, J. L. An unrecognised Etiological Factor in the Summer Diarrhœas of Infants *Med. Rec.*, vol. 70, page 416, 1906.

[†] Oserow, Ueber Frankh. d. Pferde, welche Aehnlichkeit mit d. Cerebrospinal Meningitis haben, aber durch Vergiftungen mit Gräsern von Salxgrunden (Salzmooren) verursacht werden. *Abst. in Jahresb. uber d. Leist. auf d. Gebiete d. Veterinär. Med.*, vol. 26, p. 226, 1906.

Andropogon pertusus, Willd.—A "Blue Grass."—The flower of this Australian grass is strongly scented, as can be ascertained by rubbing it between the fingers. "At times the odour may be noticed when riding in the heat of the day."—(A. R. Crawford, *in litt.*)

Andropogon refractus, R.Br.—The roots are aromatic, particularly when from tropical localities. Hackel says that in Tahiti the natives prepare a cosmetic oil, "monoi," from it. It is a common Australian grass.

Andropogon, probably *A. scandens*, Roxb., an Indian grass, is said to induce the formation of hydrocyanic acid.

Anthoxanthum odoratum, L.—The "Sweet-scented Vernal Grass" is a small grass, and contains Coumarin. It is said to cause some disturbance in animals, perhaps owing to the presence of this substance.—(A. C. Crawford.)

Avena sativa, L., common "Oats," is said to contain an alkaloid, avenine, which causes psychical excitement in horses.—(A. C. Crawford.)

Briza, our common introduced "Shivery Grass," may contain hydrocyanic acid.—(Greshoff.)

Catabrosa is a genus containing but one species, found in North America and Europe, which is said to contain hydrocyanic acid.—(Greshoff.) It is allied to *Eragrostis*.

Chrysopogon parviflorus, Benth., is called "Scented Grass" in New South Wales, owing to the sweet smell of the panicle, which is particularly observable when crushed between the fingers.

Cortaderia argentea, Stapf.—(*Gynerium argenteum*, Nees), the well-known "Pampas Grass," contains hydrocyanic acid.—(Greshoff.)

Cynodon incompletus, Nees. -Its reputed poisonous nature in New South Wales has been referred to in the April, 1912, issue of this *Gazette*.

Elymus.—A genus of harsh, sand-binding grasses from north Europe and America, contains hydrocyanic acid.—(Greshoff.)

Eragrostis has already been referred to.

Festuca.—The "Fescues," valuable grasses found in many parts of the world, are said by Greshoff—at least as regards some of the species—to contain hydrocyanic acid.

Glyceria (*Panicularia*) *aquatica* is said to be poisonous by A. C. Crawford, who quotes A. Jorissen.* Greshoff attributes this to hydrocyanic acid.

Hierchloë redolens, R.Br., and *rariflora*, Hook. f., called "Sweet-scented Grasses" in Australia. They derive this name owing to the presence of Coumarin. For an account of these scented grasses see my "Manual of the Grasses of New South Wales," pp. 103–5.

Holcus is a genus of so-called "Soft Grasses." Greshoff says that they contain hydrocyanic acid.

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* Jorissen, A. Recherches sur la Germination des Graines de Lin. *Bull. Acad. Roy. de Belgique*, 3 s., vol. 7, p. 737, 1884.

Lamarckia is a genus of grasses of which a small yellow-coloured species (*L. aurea*), introduced into the drier parts of this State from the Mediterranean region, is an example. Greshoff found hydrocyanic acid in it.

Lolium temulentum, L., the notorious "Darnel," free from fungus parasites, is harmless, according to Wilson.* I have obtained these references from A. C. Crawford.

Melica is a genus which includes many good fodder grasses, but in South Africa *M. dendroides*, Lehm., is known by the Boers as "Dronk" grass because of its poisonous nature. See under *Stipa*. Greshoff says hydrocyanic acid is found in it. There is a note on this grass by MacOwan in *Cape Agric. Journ.*, v, 117.

Panicum.—J. C. Brunnich, of Brisbane, has found hydrocyanic acid in Guinea Grass (*Panicum maximum*, Jacq.); also in P. *muticum*, Forsk., the so-called "African Wonder Grass."

Paspalum scrobiculatum, L., the Khoda Millet or Hureek of India, found also in Eastern Australia, is injurious to stock owing to the presence of hydrocyanic acid.

Poa.—The well-known genus *Poa*, which includes many valuable pasture grasses, contains hydrocyanic acid, according to Greshoff.

Sorghum.—See an important paper, "Cyanogenesis in Plants, Part ii. The Great Millet (*Sorghum vulgare*)," by Wyndham R. Dunstan and Thomas A. Henry ("Imperial Institute, Technical Reports and Scientific Papers," ii, 121. 1903).

Sorghum halepense, Pers.—See a paper, "The Poisonous Action of Johnson Grass," *Bull.* 90, Bureau of Plant Industry, 1906, by A. C. Crawford. This paper is valuably bibliographical, and has notes on other grasses in which hydrocyanic acid may be formed, *e.g.*, *Sorghum vulgare*.

Sporobolus heterolepis, Gray.—The round seeds, when bruised, emit a strong, heavy, and rather disagreeable odour. It is a native of the United States.

Stipa.—The following seems to be one of the pioneer papers on the subject of poisonous grasses:—"On a Mongolian Grass producing Intoxication in Cattle," by H. F. Hance, Ph.D., *Journ. Bot.*, xiv, 210.

In the preliminary remarks, he refers to *Lolium temulentum*, L., the "Darnel," and the South African *Melicas*, which form the "Dronk" grass of the Dutch colonists of South Africa, "on eating which, cattle become afflicted with intoxication to an alarming extent" (*Journ. Linn. Soc. Bot.*, xiv, 208).

He then refers to a grass (*Stipa*) received by him from North China (Mongolia), which was poisonous to horses and other animals. Dr. Hance describes it as a new species, *S. inebrians*.

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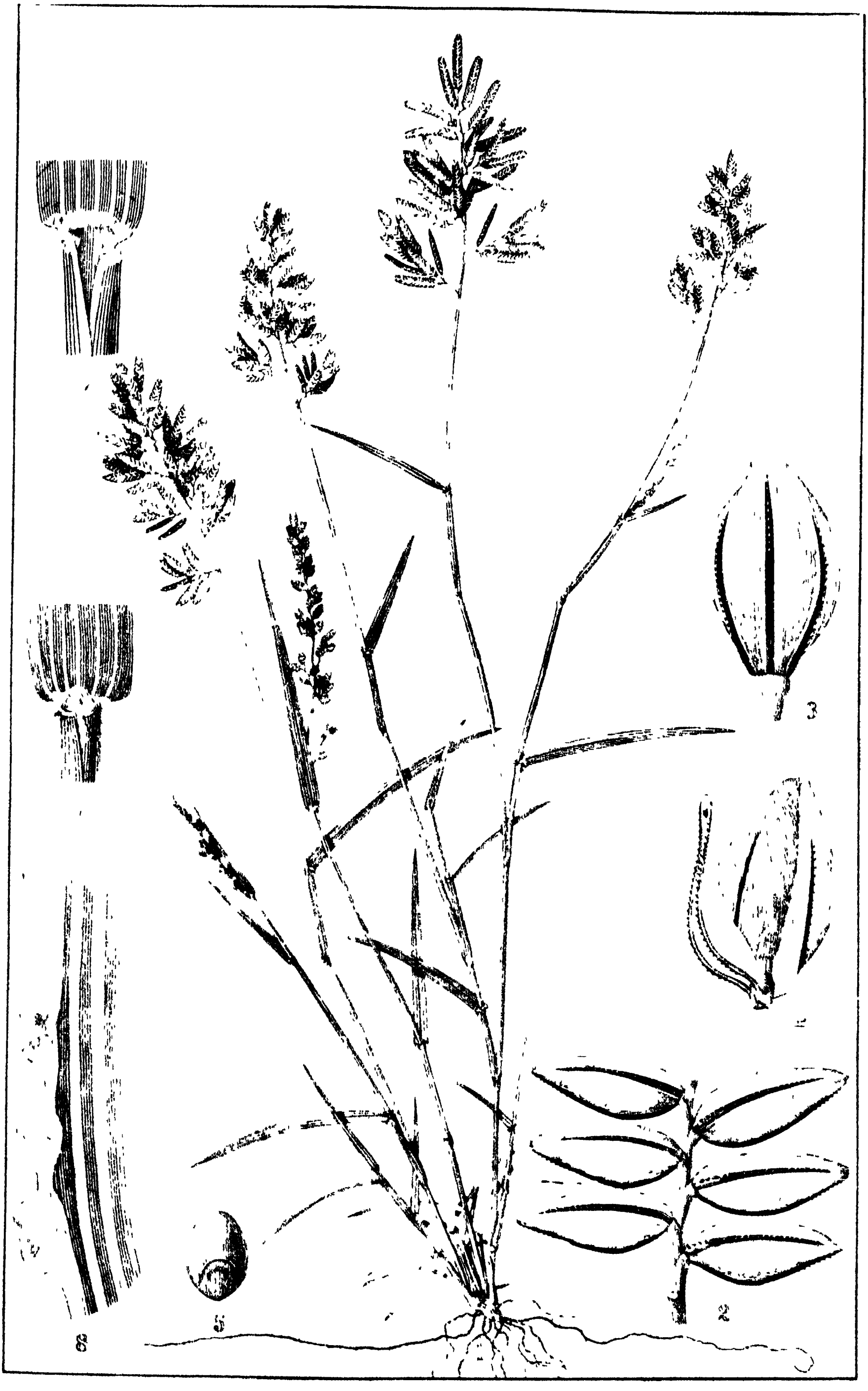
* Wilson, A. S. On *Lolium temulentum*. *Trans. Bot. Soc., Edinburgh*, vol. 11, p. 457, 1873. Further experiments with Darnel, *op. cit.* vol. 12, p. 38, 1876.—Freeman, E. M., Seed fungus of *Lolium temulentum*. *Proc. Roy. Soc. London*, vol. 71, p. 27, 1903.



Eragrostis major, **Host.**

In the next volume (xv, 267), Dr. Hance has a "Supplementary Note on Intoxicating Grasses."

A paper, by Mr. A. S. Wilson (above quoted), which seems conclusively to disprove the notion that Darnel has any poisonous properties, is mentioned.

Reference is made to the hay of *Stipa sibirica*, poisonous to cattle in Cashmere. Another specimen may be *S. parviflora*, Desf., and the effect of this grass, which is "very poisonous to horses and cattle," is described by Dr. Aitchison. The utility of acidulous drinks in cases of Stipa-grass poisoning, is believed in, in both China and India. Dr. Hance's paper, though short, is valuable.

"Notes, mainly bibliographical, on two American plants—Sleepy Grass and Creasote Bush," by Albert S. Crawford, of the Bureau of Plant Industry, U.S. Department of Agriculture, Washington, D.C. (*Pharm. Review*, Aug., 1908, p. 230), contains a list of poisonous grasses, and is especially valuable for its bibliographical references. The "Creasote Bush" is not a grass, and I will not further refer to this part of the paper. The "Sleepy Grass" is *Stipa Vaseyi*, Scribn. (*viridula*, var. *Vaseyi*), and the paper contains the best account of this grass, from the bibliographical references, known to me.

Zea, the Maize-plant, contains hydrocyanic acid, according to Greshoff.

EXPLANATION OF PLATE.

Eragrostis major, Host.

1. Whole plant, reduced in size.
2. Part of a spikelet, showing central nerve, and one lateral nerve. The third nerve is not seen with the glumes in their present position.
3. Flowering glume seen from the back, showing the keel and the two lateral nerves.
4. Flowering glume, with palea, seen from the side.
5. Grain.
6. Base of leaf, with ligule.
7. Base of leaf, with ligule of *E. Brownii*, Nees (for comparison).
8. Edge of a leaf, showing the characteristic glands (much enlarged).

LIST OF FERTILISERS IN NEW SOUTH WALES.

1912 LIST.

In the List of Fertilisers which appeared in the *Gazette* for May, 1912, owing to a slight misapprehension in the basis of calculation, a number of the values given were incorrect. The tables on pages 400 to 402 of the May issue are therefore repeated, with the necessary corrections. Readers are requested to substitute these tables for those previously published.

I.—SIMPLE FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.					Manurial Value.		
		Nitrogen.	Equivalent to Ammonia.	Lime (CaO).	Potash (K_2O).	Phosphoric Acid (P_2O_5).	£	s.	d.
Sulphate of ammonia	George Shirley, Ltd., 279 George-street	20·42	24·80	......	......	......	15	11	5
,, ,,	Australian Gaslight Co., Kent-street	20·40	24·77	......	......	......	15	11	1
,, ,,	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-street.	20·75	25·19	......	......	......	15	16	5
,, ,,	Paton, Burns, & Co., 75 York-street	20·40	24·77	......	......	......	15	11	1
Nitrate of soda	,, ,,	15·8	19·2	......	......	......	15	0	0
Kainit	George Shirley, Ltd., 279 George-street	......	......	......	12·5	......	3	9	9
,,	Paton, Burns, & Co., 75 York-street	......	......	......	12·9	......	3	12	0
Sulphate of potash	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-street.	......	......	......	53·25	......	14	17	4
,, ,,	George Shirley, Ltd., 279 George-street	......	......	......	52·0	......	14	10	4
,, ,,	Paton, Burns, & Co., 75 York-street	......	......	......	52·0	......	14	10	4
Bone phosphate	,, ,,	......	......	......	......	29·8	4	7	0
Gypsum fertiliser	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-street.	......	......	98·0 Cryst. $CaSO_4$.	......	......	......		

II.—BONE AND BLOOD MANURES.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.		
		Nitrogen.	Equivalent to Ammonia.	Phosphoric Acid.	Equivalent to Tricalcic Phosphate.	£	s.	d.
Special fertiliser, No. 3	Co-operative Wholesale Society, Alexandria ...	5·0	6·07	18·0	39·29	6	8	9
Bone-dust, B.D.1	Paton, Burns, & Co., 75 York-street	3·7	4·5	22·12	48·22	6	1	0
„ B.D.2	„ „ „	3·7	4·5	22·12	48·22	6	1	0
„ B.D.3	„ „ „	3·3	4·0	20·07	43·75	5	8	9
„ B.D.4	„ „ „	3·3	4·0	18·4	39·71	5	4	0
Bone and blood, B.B.1	„ „ „ ...	5·7	6·92	18·0	39·29	6	19	6
„ „ B.B.2	„ „ „	5·1	6·20	12·0	26·16	5	12	9
Bone and blood manure	R. S. Lamb & Co., 55 Pitt-street ...	5·76	7·0	13·74	30·0	6	8	0
A 1 bone-dust...	„ „ „	3·7	4·5	21·98	48·0	6	0	6
⁂ bone-dust	„ „ „	3·91	4·75	22·9	50·0	6	6	6
Vulture manure	„ „ „	3·29	4·0	18·32	40·0	5	3	6
Blood and bone manure	Silvester Bros., Regent-street, Redfern ...	3·99	4·84	21·98	47·98	6	5	0
Raw or green bone-dust	A. Wooster, Epping	4·01	4·86	24·41	53·3	6	12	3
Blood and bone-dust	„ „	5·76	7·0	13·74	30·0	6	8	0
Pure steamed bone-dust ...	„ „	3·91	4·75	24·5	53·5	6	11	0
Blood and bone manure	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-street.	5·5	6·67	18·0	39·29	6	16	6
Bone-dust	„ „ „ „ ...	4·25	5·16	21·85	47·7	6	8	6
„	I. Tester, O'Riordan-road, Alexandria ...	3·7	4·5	21·98	48·0	6	0	6
White bone-dust	Sydney Soap and Candle Co., Ltd., 365 Kent-street	3·5	4·25	27·00	58·86	6	12	3
Blood and bone manure	„ „ „ ...	5·0	6·07	17·0	37·06	6	6	0
Bone and blood manure	J. Cooke & Co., Sandown, Granville	6·85	8·32	10·44	22·82	6	15	0
„ „ „	Jas. Barnes, Granville South	5·21	6·32	15·74	34·36	6	5	6
Blood	B. Richards and Sons, Ltd., Riverstone	13·75	16·0	....	... .	10	9	9
Bone-dust	M. Gearin, Gardener's-road, Botany	3·7	4·5	23·47	51·29	6	5	0

III.—SUPERPHOSPHATES, MIXED FERTILISERS, AND IMPORTED FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.		
		Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	£	s.	d.
Superphosphate No. 1, 36–38 %	George Shirley, Limited, 279 George-street	....	17·0	....	....	4	3	7
,, No. 2	,, ,, ...	1·6	15·0	33·0	1·	7	13	3
,, No. 3	,, ,, ...	3·3	13·0	28·0	2·	8	6	8
,, No. 5	,, ,, ...	3·3	12·0	26·0	7·	9	7	0
,, No. 7	,, ,, ...	1·6	11·4	25·0	1·	6	3	5
,, No. 9	,, ,, ...	4·1	6·5	14·0	4·	6	17	6
,, No. 11	,, ,, ...	....	11·4	25·0	7·	6	12	6
,, No. 12	,, ,, ...	3·3	5·5	14·7	2·	5	13	9
,, No. 14	,, ,, ...	2·5	5·5	14·2	6·	6	2	6
,, No. 18	,, ,, ...	... .	5·5	14·2	6·	4	4	6
,, No. 19	,, ,, ...	4·1	4·1	11·4	2·	5	14	0
Bone phosphate A	,, ,, ...	·5	....	29·8	....	4	14	6
,, ,, M	,, ,, ...	1·6	....	16·0	1·	3	16	8
,, ,, N	,, ,, ...	1·6	....	16·0	4·	4	13	5
,, ,, O	,, ,, ...	2·5	....	13·7	6·	5	11	6
No. 1 Superphosphate	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-st.	....	17·0	18·1	....	4	6	4
A1 ,, ...	,, ,, ,, ...	....	20·5	21·5	....	5	4	0
Nitro-superphosphate	,, ,, ,, ...	1·35	15·44	19·05	....	5	6	5
Bone superphosphate	,, ,, ,, ...	1·5	9·0	20·5	....	5	1	4
Marion Guano	,, ,, ,, ...	....	....	31·0	....	4	5	3
No. 6. Potato Fertiliser	A. Wooster, Epping	4·52*	....	14·91	5·	7	0	4
No. 7. Complete Fertiliser ...	,, ,, ...	5·01†	....	14·56	2·	6	10	0
Superphosphate	Paton, Burns, & Co., 75 York street	....	17·0	....	....	4	3	7
Complete Mixed Manures, P.B.1	,, ,, ...	4·3	4·25	9·75	5·	6	9	6
,, ,, P.B.2	,, ,, ...	3·75	4·25	9·75	7·1	6	12	10
,, ,, P.B.3	,, ,, ...	3·4	5·10	9·0	7·1	6	7	4
,, ,, P.B.4	,, ,, ...	3·3	2·75	9·65	7·1	6	2	6
,, ,, P.B.5	,, ,, ...	4·3	4·25	9·75	2·4	5	15	0
,, ,, P.B.6	,, ,, ...	3·3	6·0	12·68	2·4	5	11	6
,, ,, P.B.7	,, ,, ...	1·7	6·8	13·47	1·2	4	4	5
,, ,, P.B.8	,, ,, ...	·82	8·5	10·80	7·1	5	0	3
,, ,, P.B.9	,, ,, ...	2·47	....	9·09	4·9	4	10	0
,, ,, P.B.10	,, ,, ...	2·47	....	10·5	4·9	4	13	10
,, ,, P.B.11	,, ,, ...	2·47	....	10·5	2·4	4	0	0
,, ,, P.B.12	,, ,, ...	1·6	....	14·9	·6	3	8	9
,, ,, P.B.13	,, ,, ...	....	....	12·0	7·1	3	12	8

* ·75 Ammoniacal. † 1·20 Ammoniacal.

Lucerne for Dry Districts.

H. ROSS, Inspector of Agriculture.

STOCK-OWNERS in dry districts are constantly endeavouring to devise means by which the natural pastures can be improved in order to increase their carrying capacity. There is, perhaps, no more profitable and surer way to do this than to convert some of the grazing or cultivation areas into lucerne paddocks. Sowing imported and indigenous grasses, or top-dressing with fertiliser the grazing areas, has, in dry districts, never met with such a degree of success as lucerne-growing.

How easily lucerne adapts itself to fairly dry climatic conditions is constantly brought under notice by the ever-increasing areas being put under lucerne in the dry areas of the southern and south-western parts of the State. Many thousands of acres in these districts, generally considered only fit for wheat-growing, will, if thoroughly prepared, give a satisfactory return in average seasons when sown with lucerne.

Preparation of the Soil.

The land should be ploughed in autumn or early winter the year before it is intended to sow the seed. Plough 9 inches deep, provided the top soil reaches down to that depth. In case the top soil is only 5 to 6 inches deep, then the land should be ploughed to that depth; and a second plough, with the mould-board taken off, should follow the first plough, and stir the subsoil to a further depth of 6 inches. Care must be taken not to bring any of the subsoil to the surface.

The ploughed land should then be allowed to lie in the rough state during winter, and be broken down in the beginning of spring with harrows. During the summer months, the land must be frequently worked with harrows or cultivator, so as to allow neither growth of weeds nor the formation of a hard crust on top. If the seed-bed cannot be worked down sufficiently fine with the harrows, a one-way disc cultivator or roller will soon do all that is necessary. If the land is rolled, it should be harrowed immediately after the rolling.

The success of lucerne-growing in dry districts depends almost entirely upon the thorough preparation of the soil, and the ideal conditions to be aimed at are a deeply ploughed soil, in which the previous year's rainfall has been conserved, together with a finely worked surface as a seed-bed.

Method of Sowing.

Lucerne can be sown in the southern or south-western districts either in autumn or in spring. The farmer must use his own discretion in this respect. Should late summer rains have fallen, and the soil be in a condition to ensure an immediate germination, an autumn sowing should be made. If, on the other hand, a dry summer and autumn are prevailing, as has been the case this year, the sowing should be made in spring, about September.

From 10 lb. to 12 lb. of seed per acre will be found to be a sufficient quantity if evenly applied. Broadcasting by hand is not recommended, as the seed cannot be so evenly sown as when a drill is used. If, however, it is necessary to broadcast the seed, it should be mixed with treble its bulk of sand, ashes, or fine soil.

It is advisable to apply, at time of sowing seed, from 60 lb. to 80 lb. of superphosphate per acre. This will ensure a good start for the young plants, and encourage them to develop a good root system.

One of the best methods of sowing the seed is to mix throughly 70 lb. of superphosphate with 12 lb. of lucerne seed; put the mixture into the *manure-box* of an ordinary seed drill, and set the drill to sow about 80 lb. of manure per acre. The discs or hoes of the drill should not be set into the soil too deeply. Some drills, especially when new, cannot be set to a shallower depth than 1½ to 2 inches; in such a case a good plan to follow is not to set the lever of the drill into the first notch, but to let it dangle. The cogs of the drill will be in gear, but the hoes will not go down as deeply as if the lever had been set into the first notch. In this way the seed will be sown about ¾ inch deep.

Special care must be taken not to fill the manure box right up. Not more than sufficient seed and manure for 1 acre, *i.e.*, about 80 lb., should be put into the drill at one time, and this should be stirred up occasionally to prevent the seeds rising to the top of the manure.

In order that the seed may be thoroughly covered, it is advisable to either improvise a brush harrow at the back of the drill, or to harrow after sowing with light poppy harrows.

Treatment of Paddock after Sowing.

Barley grass, trefoil, or other foreign seeds, germinating with the lucerne seed, are frequently a serious menace to the young plants. If such should be the case, the mower should be run over the paddock before the foreign grasses run to seed. As the cutting thus obtained is a very light one, and of little value, it is advisable not to gather, but to leave it to act as a mulch to the young lucerne crop.

In average seasons two cuttings will be obtained from the paddocks, besides providing excellent pastures for topping off sheep or lambs for market.

The sheep should never be allowed long enough in the paddock to eat too deeply into the crown, and thus destroy the plant. After each feeding-off, the paddock should be thoroughly harrowed in both directions with heavy harrows.

If, after a few years, the lucerne shows signs of going off, a top-dressing will be found beneficial. To do this, a mixture of about 80 lb. of superphosphate and 20 lb. of sulphate of potash should be applied with the drill. The tubes leading into the hoes of the drill should be taken off, as otherwise the manure will be sown in rows 7 to 8 inches apart. If sown, however, without the tubes, the manure will be evenly broadcasted. A heavy harrowing must follow the top-dressing.

The "Birdsell" Alfalfa Huller.

F. DITZELL, Experimentalist, Cowra Experiment Farm.

THE following is a report upon the "Birdsell" Alfalfa (lucerne) Huller (thresher) with automatic feeder and web stacker, as seen on Mr. Paul Wenz' "Nanima" Station, Forbes, N.S.W., on Friday, 2nd February, 1912. The accompanying sketches, Figs. 1, 2, and 3, indicate the construction of this machine.

The Automatic Feeder.

The automatic feeder, as illustrated in Fig. 1, consists of a travelling elevator, composed of wooden slats studded with nails sloping upwards, which carry the sheaf or loose lucerne, as it is pitched on to the elevator from waggons drawn up alongside, past the rods to the forks and knives, which cut the bands (in sheaf lucerne) and feed it into the main peg drum. A distinctive feature about this automatic feeder is that it never chokes the machine. If the lucerne is pitched too fast on to the elevator, the accumulation of lucerne presses against the rods, which operate a band-brake that temporarily stops the feed elevator from travelling until the lucerne is cleared away into the drum.

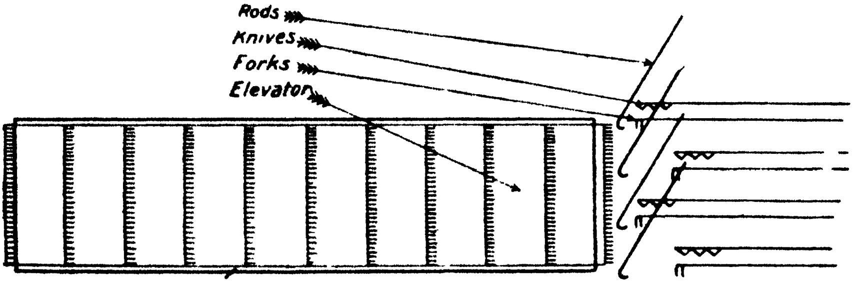


Fig. 1.—The Automatic Feeder.

The Huller.

A plan of the huller is given in Fig. 2. The passage of the lucerne and seed through the huller is as follows :—The lucerne is fed into the main peg drum by the automatic feeder, and here it is to a large extent threshed—the seed pods are broken off the stalks, and many of them are threshed. The straw-shakers then separate the straw (stalks, leaves, &c.) from the seed. The straw is conveyed away by the web stacker, which is simply an ordinary straw elevator, whilst the pods and seed are returned to the rasp drum (hulling cylinder and concave), where the proper threshing takes place. Lucerne seed really requires to be threshed by a rubbing motion, and this is obtained in the rasp drum. As the material leaves the rasp drum, the seed, broken pieces of pods, &c., are carried by an elevator to a set of finer sieves, and whilst passing through these the seed is subjected to a blast, so that it is cleaned fairly well. The seed is then taken by an Archimedean screw to the other side, where it is elevated to the recleaner, which is described below.

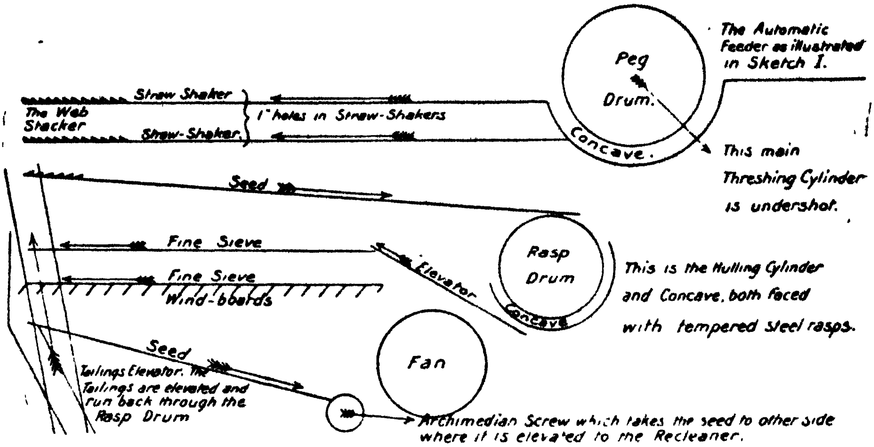

The Automatic Feeder as illustrated in Sketch I.
Peg Drum.
Concave.
This main Threshing Cylinder is undershot.
Straw Shaker
The Web Stacker
1" holes in Straw-Shakers
Straw-Shaker.
Seed
Fine Sieve
Fine Sieve
Wind-boards
Elevator
Rasp Drum
Concave
This is the Hulling Cylinder and Concave, both faced with tempered steel rasps.
Fan
Seed
Tailings Elevator. The Tailings are elevated and run back through the Rasp Drum
Archimedian Screw which takes the seed to other side where it is elevated to the Recleaner.

Fig. 2.—The Huller.

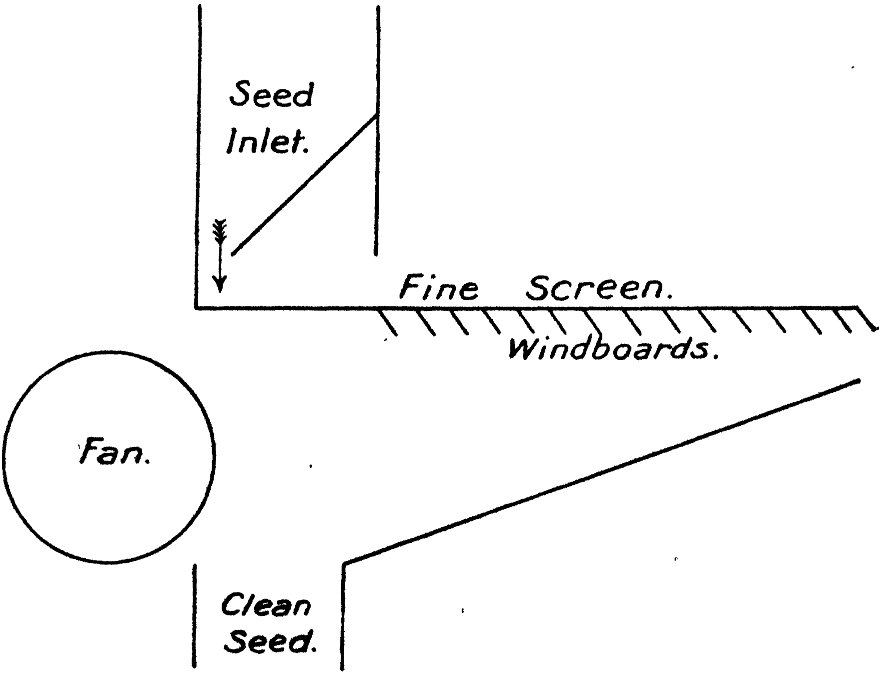


Fig. 3.—The Recleaning Apparatus.

A couple of points worth noting are—(1) That the tailings are returned to the centre of the return table, and thus run no chance of choking the rasp drum; and (2) the presence of windboards under one of the fine sieves to direct the blast upwards and backwards, thus cleaning a better sample.

The Recleaning Apparatus.

This recleaning apparatus, outlined in Fig. 3, gives an almost perfect sample. Special attention is directed to the windboards, which direct the blast upwards and backwards, and thus assist very greatly in the cleaning of the sample.

This machine is manufactured by the Birdsell Manufacturing Company, South Bend, Indiana, U.S.A. Its price is £160.

The two striking points about this Alfalfa Huller are—(1) the absence of the requirement of manual labour on the machine itself, as other than pitching the lucerne from the waggons on to the automatic feeder, and afterwards attending to the straw as delivered by the straw elevator, the services of one man are only occasionally required to oil up the bearings, &c., and take a bag of seed off now and again; and (2) the splendid sample it cleans. There is absolutely no rubbish left in, and all very light grains are removed.

The capacity of this machine on "Nanima" is about 12 acres of lucerne per day. The amount of stem and leaf to be passed through it determines its capacity. The amount of seed obtained thus varies with the productivity of the crop. In the above instance it was about 2⅓ bushels per acre, or 28 bushels per day.

As the above illustrations and descriptions indicate, this huller is a machine of many parts, and a man with some mechanical knowledge requires to be in charge of it.

BORERS IN HOUSES AND FURNITURE AT YASS.

A GENTLEMAN who recently built and furnished a house at Yass found it seriously damaged by borers, and asked that the Government Entomologist be permitted to investigate the matter. Mr. Froggatt found that the chief damage had been caused by the Powder Post beetle (*Lyctus brunneus*), almost a cosmopolitan pest. This pest had evidently been introduced with new furniture from Sydney. It may run itself out, in perforating the sap-wood, within a year or two, or it may be found working in some of the softer timber for years. The only known remedy of any use is to soak the infested areas with turpentine, and this the owner is now doing.

Other borers that had appeared were some small *Xylobori*, Shot or Pin-hole beetles, which had very probably bred out of the new native pine timber used in the woodwork of the house. There will be no more trouble from these.

Trials of Soy Beans.

In October, 1911, seeds of Soy Beans received from Victoria were distributed by the Department of Agriculture to various centres in New South Wales for trial. These seeds were supplied as being of a specially suitable variety for our conditions.

In November, small packets of soil received from China were sent to Cowra and Wagga Experiment Farms, with instructions that the soil in which the Soy Beans were to be grown should be inoculated with the China soil, and results carefully noted.

The following is a summary of the reports received :—

COASTAL DISTRICTS.

Mr. George Marks, Inspector of Agriculture, supplied seed to Mr. H. B. Faviell, Bonville, who sowed it early in December on well prepared land; but with the exception of one plant the seed failed to germinate. The weather conditions were somewhat dry at the time, which may have been responsible for the failure. In January, as the land was required for other purposes, the plot was ploughed up.

At Wollongbar Experiment Farm the seeds failed to germinate.

At the Hawkesbury Agricultural College the Soy Beans were planted on 25th November, but while still young they were completely eaten off by rabbits or hares. The same thing happened to other Soy Beans planted amongst Cowpeas, the latter being untouched.

Mr. R. N. Makin, Inspector of Agriculture, had some seed sown at Unanderra. It came up well, but suffered severely on account of the dry weather conditions. Only a few plants came to maturity. Their growth was very rapid compared with other varieties. About as much seed was saved as was put in, and further trials will be conducted.

TABLELAND DISTRICTS.

At Bathurst Experiment Farm the beans were sown on the Irrigation area on 2nd February. The germination was faulty, only about 50 per cent. of the plants appearing above ground. The pods commenced to form on 11th January, and the plants had then grown to an average height of 3 feet 6 inches. The plants all carried a large number of pods, which were harvested on 12th April.

This variety of Soy Bean made better growth and appears better suited to the conditions of Bathurst Farm than any other previously grown there.—J. W. SHAW, Experimentalist.

No sowing has yet been made at Glen Innes Farm.

WESTERN SLOPES.

Mr. A. H. E. McDonald, Inspector of Agriculture, supplied seed to Mr. G. A. D. Simpson, a farmer of the Tamworth district who is very interested in new crops, but owing to the dry weather no results were obtained.

At Cowra Experiment Farm, two rows of these Soy Beans were planted on 24th November, in land previously cropped with Yorkshire Hero Peas, which had produced only very small plants, practically failures. In Row 1, 110 seeds were planted; the soil was not inoculated. In Row 2, 110 seeds were also planted, but in this case the soil was inoculated with the soil received from China, this being effected by striking out a small furrow with a hand plough and then sprinkling the soil into the bottom of this furrow, thoroughly mixing it with the ordinary soil by stirring with a stick. After this the beans were dropped by hand, 6 to 7 inches apart (they were planted this close because Soy Beans are generally "shy" at germinating), and covered in. The method of planting Row 1 was the same, save that no soil inoculation took place. On 3rd January, 1912, 26 seeds had germinated in Row 1, and were all growing well, being up to 10 inches high and flowering. In Row 2, 30 seeds had germinated, and were also growing well, being 10 inches high and flowering. There were no apparent differences between the Soy Beans in each row. On the 27th idem the beans in both rows were still fairly even in growth, in each case being up to 1 foot in height and in flower, a few plants bearing very small pods. Subsequently, on account of the hot, dry weather, these plants gradually died down without producing any decent seed. The weather was really too unsuitable to give these plants a fair chance.—F. DITZELL, Experimentalist.

RIVERINA.

At Wagga Experiment Farm the test was a failure. Seeds were sown in good moist soil, but germination was very bad. The few plants soon died off during the hot, dry summer. Inoculation of the soil appeared to have no effect.

Mr. H. Ross, Inspector of Agriculture, arranged for trials by Messrs. B. J. Stocks, Harden, and G. Laidlaw, Elm Park, Jindera, via Albury.

At Harden the seed was sown in the garden, and the plants watered on several occasions, but at Albury it was sown in drills 2 feet 6 inches apart, under ordinary field conditions, early in October. Only a few of the seeds germinated, and the plants soon died off on account of the dry conditions prevailing at the time.

At Yanco Experiment Farm, two sowings were made in soil in good condition, but the results from both sowings were very poor. Few seeds germinated, and those which did grow were very weak. Some of the seed was soaked for twelve hours before sowing, and some sown dry. A small quantity of seed was saved from the plots.

WESTERN PLAINS.

Mr. M. H. Reynolds, then Inspector of Agriculture, had arranged for several sowings in the west. Mr. Inspector Wilson reports that the trials were a decided failure. The crops were very poor in every case, and did not permit of harvesting.

At Nyngan Demonstration Farm, two rows each 4½ chains long were planted with seed drill on 18th November, at the rate of about 10 lb. per acre. For comparison, several rows of Black Cowpeas were planted on either side at the same rate of seeding. A few days after planting, beneficial rain fell in ample quantity to cause germination. The Cowpeas germinated sooner and much more evenly than the Soy Beans, and the growth of the Cowpeas throughout was much more vigorous than that of the Beans. On the 1st April, 1912, after a period of over three months, in which only 64 points of rain had fallen in seven separate falls, the greatest being 19 points, twelve average plants of each of the legumes under trial were cut and weighed, giving the followin gresults:—Cowpeas, 6 lb.; Soy Beans, 1 lb. In addition to the superiority in weight of plants, the number of Cowpea plants in the row was five times as great as that of Soy Beans, so that there was thirty times as much weight of Cowpeas as of Soy Beans from an equal area.

The trial shows that, as a fodder plant for the dry districts of this State, the Soy Bean is not nearly so suitable and valuable as the Black Cowpea, which is a much better drought-resister, a quicker and much more vigorous grower, and produces a much greater quantity of fodder.—H. J. KELLY, Manager.

"APTERITE" SOIL FUMIGANT.

AT the request of the proprietors, some tests have been made at the Hawkesbury Agricultural College to ascertain the effect of this preparation upon eel-worms in the soil. A piece of light sandy soil was selected for the trial. The rubbish and weeds were either burnt or carted away, and the ground ploughed on the 6th October, 1911, and harrowed on the following day. It was then cultivated once a fortnight until 18th December, when "Apterite" was sown by hand, and the ground ploughed 4 or 5 inches deep. The area had been divided into nine plots, and applications were made at varying strengths, from 103 to 656 lb. per acre. Untreated strips were left between the plots for observation purposes.

The ground was then harrowed and rolled, and on 21st December sown with Poona cowpeas. A few patches of green summer grass which were on the ground at ploughing time, were harrowed out before sowing.

Half of the area was uniformly affected by eel-worm to such an extent that very little seed was formed, and all the plants died before full maturity. The other half, with the exception of a small strip adjoining the damaged section, was only slightly affected. The only conclusion that can be drawn is that the application of "Apterite" made no difference in the severity of the affection, and did not prevent the eel-worms from attacking the plants.

Tobacco Crops in Southern and Western Districts, 1911-1912.

JOHN GILMOUR.

Southern District.

UPON visiting Tumut and district, in the interests of the Department of Agriculture, I found that the tobacco crop in the southern district is larger, the colour brighter, and the quality better than last season's crop. There will be from 70 to 80 tons this year, as against 30 tons last year, which is a very small crop for this district compared with what it used to be years ago. There would, however, have been a much larger crop but for the very dry season experienced, which prevented the plants from growing to their normal size.

The growers are beginning to appreciate the advice given them as to the treatment of the tobacco on the poles in the field to obtain a better colour in the leaf—that is, in making more use of the sun to yellow the leaf before putting it into the drying-sheds. As most of the growers of tobacco in the southern district are Chinese, and are very conservative in their ideas and practices, it is not an easy matter to get them to adopt new methods; but some of them have tried the suggestions made to them, and are now convinced that this method of sunning their tobacco produces brighter-coloured leaf.

I have also impressed upon them the necessity of irrigating their land, if they wish to be sure of a crop every year, instead of depending altogether upon the rainfall, which is more or less uncertain at the time it is most needed. If given a fair start, tobacco will withstand a dry spell better than most other plants, but it must have a good start after transplanting.

At Tamworth, where they have had quite as dry a season as at Tumut, they have never had a better crop than they have raised this year, just because they have gone in for irrigating their land; and Tumut lends itself to irrigation quite as much as Tamworth and district. It seems a pity that advantage is not taken of the plentiful supply of water in Tumut district, instead of allowing it to run away past the very doors of the growers.

I have hopes of more Europeans taking to the cultivation of tobacco again, as they have had it explained to them, and are now convinced that if they irrigate they can reasonably expect good returns from a tobacco crop each season. The southern district is adapted to produce as good tobacco as any other in Australia, and now that the prices are so favourable to the growers, it should become a very profitable crop to both grower and landlord. I am certain that there will be a much larger area under tobacco next year.

Western District.

In this district the crop is much better and larger than we expected to see it this year, in view of the dry season experienced. The crop amounts to about 120 or 130 tons of good coloured, clean tobacco, as compared with 100 tons last year. The leaves are not as large as they might have been with a good growing season, and the texture is much lighter for the same reason; but, for all that, it is a good crop all things considered, and the growers are satisfied with it. Some of them have taken the advice given them last year, and have gone in for irrigation, and they have been amply rewarded for their enterprise. From conversations in the district with a few of the land-owners, it is certain that some of them will start in the industry on their own account, instead of letting their land to others, now that they are convinced that "there is money in it."

Conclusion.

In travelling round the various districts this year, we were struck with the great success attending the efforts of those who have gone in for irrigation in connection with tobacco cultivation, some of the finest crops I have ever seen having been raised by this method. Not that tobacco requires much water, but it must be given a fair start, when, as experience proves, it is as hardy as most other plants. Last season being a very dry one, those who irrigated had almost complete control of the moisture; hence the fine results obtained by judicious flooding.

The only danger that I can see in the future lies in over-production; but growers in all the districts are now known to the manufacturers, and when the supplies are becoming greater than the demand, they can be informed of the state of the market, and advised to hold off for a season—a thing easily done *if ever required.* Thus the minds of the growers can be kept easy, and the manufacturers and public supplied.

FALLOWING IN VICTORIA.

THOSE who are not yet convinced of the advantages of fallowing in the drier districts of this State are advised to get the June issue of the Victorian *Journal of Agriculture.* Mr. A. E. V. Richardson, M.A., B.Sc. (Agric.), Agricultural Superintendent, is writing a series of articles on "Wheat and its Cultivation," and in the June issue he gives results of some experiments in South Australia, and of a number of tests of different kinds at the Rutherglen and Longerenong Agricultural Colleges, as well as statistics of yields from fallowed and unfallowed land in Victoria. The figures in themselves are most convincing; but the article is rendered more valuable still by the simple practical manner in which Mr. Richardson explains the principles underlying the practice of fallowing, and the time and method of carrying out the work. We would advise our wheat-growers not to let Interstate jealousy prevent them from obtaining useful information, but to write to the Director of Agriculture, Melbourne, for a copy of the June *Journal of Agriculture.* Price, 3d.

Rope.

ITS USE AND CARE ON THE FARM.

J. W. HADFIELD, Instructor in Agriculture, Hawkesbury Agricultural College.

A LARGE assortment of fibres, either pure or in mixtures, are made into cordage. In a rapid survey of all these rope-making materials, none stands out with such pre-eminence as Manila hemp. The fibre is produced from the Abacá (*Musa textilis*), a plant closely related to the banana. Its cultivation is almost exclusive to the Philippines, where it forms three-quarters of the total export. The fibre is 6 to 12 feet long, and is wonderfully resistant, forming one of the strongest and most satisfactory ropes for farm work now manufactured. It is moderately pliable, nice to handle, and will stand the wet so successfully that it is rarely if ever tarred.

Manila hemp is one of the few fibres that can be used with success in self-binding machinery. Sisal is also used quite extensively for binder twine, either pure or mixed with New Zealand and Manila hemp, and, with the rapid development of self-binding machinery, its use will probably become more and more extensive where Manila cannot be procured. A trial was recently given here of sisal in the reapers and binders, but the twine was found too stiff and liable to kink, while the tie did not hold with the tenacity of Manila. It is estimated that sisal has only about two-thirds the working strength of the best Manila.

The maximum strain could be resisted by a rope if the fibres were laid parallel. This being impracticable, the fibres are first twisted into yarns; these are laid up into strands; and finally three strands go to make the rope. The object of twisting is to make the rope portable, and to ensure that, by mutual friction, the fibre, yarns, and strands may hold together when the strain is applied. Laying up or twisting a rope decreases the strength, but increases its durability. The tarring of rope results similarly in excluding the wet, and preserving the rope at the expense of the breaking strain.

Rope is measured by its circumference, and sold by weight. The following table will give an idea of the approximate weights of convenient lengths of Manila:—

MANILA ROPE.

Approximate Weights for given Lengths.

Coils.	Size.	Weight.			Coils.	Size.	Weight.		
feet.	inches.	cwt.	qr.	lb.	feet.	inches.	cwt.	qr.	lb.
800	½	0	0	14	100	3½	0	1	16
800	1	0	1	0	100	4	0	2	0
800	1½	0	2	10	100	5	0	3	4
800	2	1	0	5	100	6	1	0	14
800	2½	1	1	22					
800	3	2	0	12					

To prevent rope, and more especially binder twine, from kinking, it is necessary when commencing to use it from the centre of the coil, to make it unwind in the opposite way to that in which the hands of a clock revolve. The end is usually protruding from the correct side of a ball of binder twine, but before threading it, or tying it to the upper ball in the twine box, this point should be looked to, and if necessary the end pushed through to the other side.

Splicing.

In studying splicing, it is essential to have a clear understanding of the analysis of a rope. The yarns are formed by twisting the fibres to the right, *i.e.*, clock-wise. Several yarns twisted anti-clock-wise form a strand, while three strands laid clock-wise, like the yarns, go to form the ordinary three strand rope. (Fig. 1.)

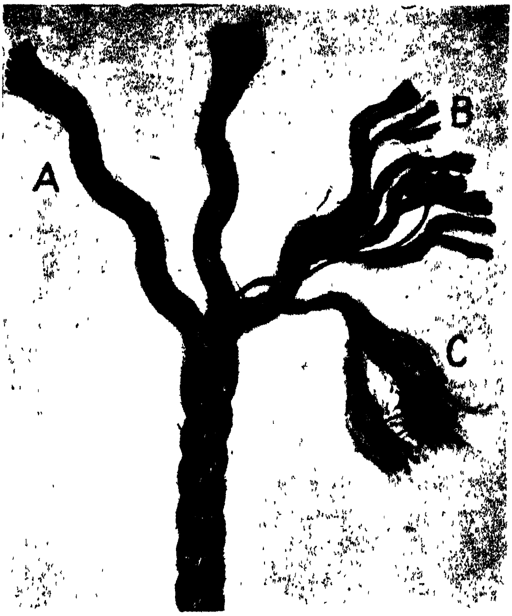


Fig. 1.—Analysis of a Rope.
A. Strands. B. Yarns. C. Yarns unravelled to show fibres.

Before continuing further, the fact should be emphasised that this article will prove practically valueless unless the reader takes a three-strand rope into his hand, and endeavours to follow out the instructions given with the aid of the illustrations. It should not take more than an hour to learn the elementary principles, and it will be found surprising how often a knowledge of splicing can be applied in everyday work.

There are two common splices, the short and the long. For average work on the farm, where the rope is not to be used in block and tackle, a short splice is all that is necessary. But where a uniform thickness is required throughout, the long splice is essential. There is little difference in the relative strength of ropes spliced by these two methods; the quality of the work is a far more influential factor in determining which should be used. A well-made splice will reduce the strength of a rope by about one-eighth.

The Short Splice.

In a short splice the strands are laid back a distance which will depend upon the thickness of the rope. A little practice will soon enable one to gauge how far, while as a guide to start with, 9 inches will amply suffice to splice ordinary plough reins of 1¼ inches circumference. Such rope is the best to practise on, and it should preferably be moderately new, as old worn rope unravels too easily and makes the work doubly hard.

The ropes are then brought end to end, as hard up as possible, with each strand of No. 1 rope between two strands of the opposite rope, No. 2. (Fig. 2.) No. 1 rope and the strands of No. 2 rope are held very firmly in the left hand, and to commence with may be temporarily lashed in position. The strands of rope 1 are then interwoven with those of rope 2, by taking each one separately, jumping over the strand immediately the other side of it, and under the next one further on. (Fig. 3.)

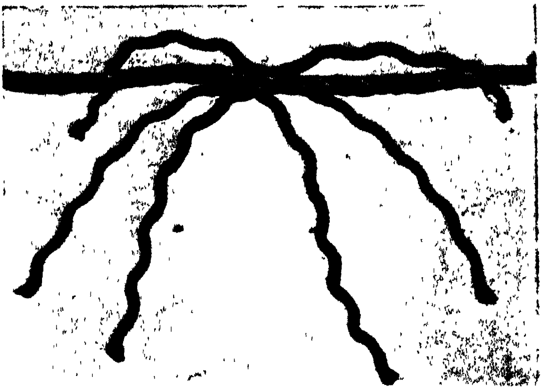


Fig. 2.—Short Splice. The two ropes laid back and brought end to end, ready for splicing.

To do this without loosening the strands held tightly in the left hand, it is necessary to twist rope 2 with the right hand, and place the first finger of the left hand underneath the strand to keep it open. The strand that is to be interwoven is then pushed through with the thumb of the left hand. Twisting thus to make room for the strands loosens the rope, and it should be twisted back again every time to its original position before starting with the next strand. Continuing, the other two strands of rope 1 follow suit, going over the strand immediately the other side, and unde the next. To make it convenient, the rope is gradually turned over, taking the greatest care not to loosen the grip in the left hand. When one side is completed, the rope is turned so that the strands of rope 2 can be woven into rope 1 with the right hand. The six

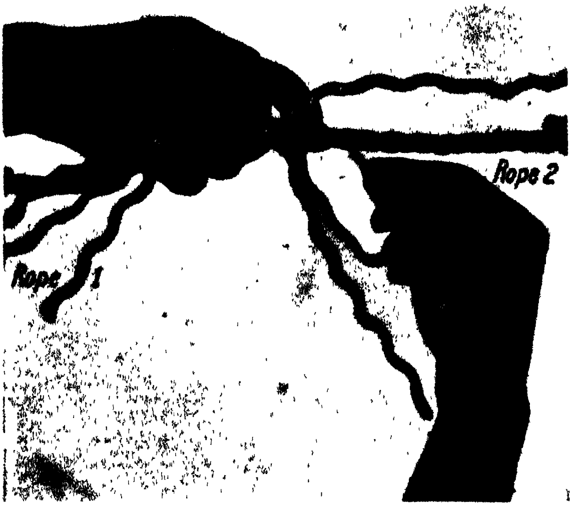


Fig. 3.—Short Splice. The position of the hands, placing the first strand of Rope 1 under Rope 2.

strands are then hauled taut (Fig. 4), the durability of the splice largely depending on whether this is done thoroughly. The weaving continues in the same way, working at each end alternately, hauling the strands taut, and twisting the rope back into its original position to prevent its getting slack.

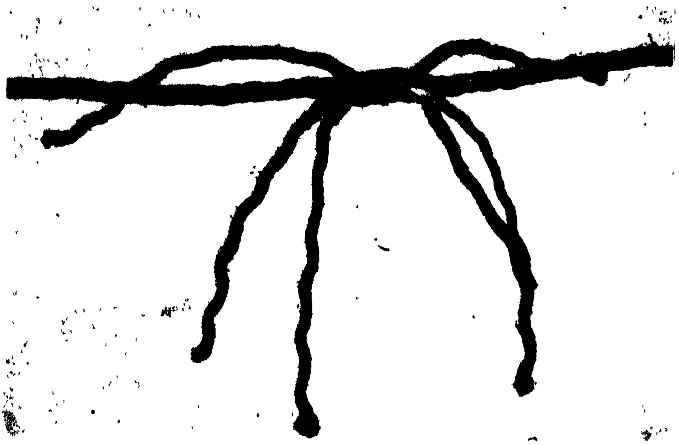


Fig. 4.—Short Splice. Each of the six strands woven once and hauled taut.

For thick rope, especially when new, a sharpened piece of iron or hardwood called a marlinspike has to be used for levering up the strands, as the rope is too stiff and rough for the fingers.

To taper a short splice at each end, and thus enable it to pass over obstacles with less likelihood of jamming, one or more yarns, according to the size of the rope, are cut off the strands every time the latter are interwoven, till, at the end of the splice, only one or two strands are passed under, and thus the thickness increases gradually to the centre (Fig. 5).

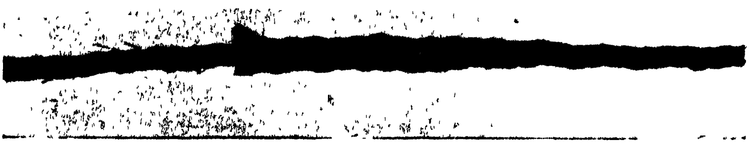


Fig. 5.—Short Splice finished. For comparison, one end has been tapered, and the other ended abruptly.

It is always a good plan, before cutting off the ends, to roll the spliced portion under foot; the ends can then be cut off close, but if this is done before rolling, they soon work their way from under the last strand where they were placed. In old rope the fibres are broken to such an extent that this method of tapering will not succeed, and the best way is to flay out the strands with a knife. The resulting splice is never so neat, nor perhaps quite so durable, but it is the best that can be done under the circumstances.

The Long Splice.

Where the thickness of a short splice will interfere with the convenient handling of a rope, or in fact where any rope above 2 inches in circumference is to be spliced, the best method is to use what is termed the "long splice." It entails the use of more rope, and is harder to make, but the resulting splice is much neater, and its advantages will usually justify the extra trouble.

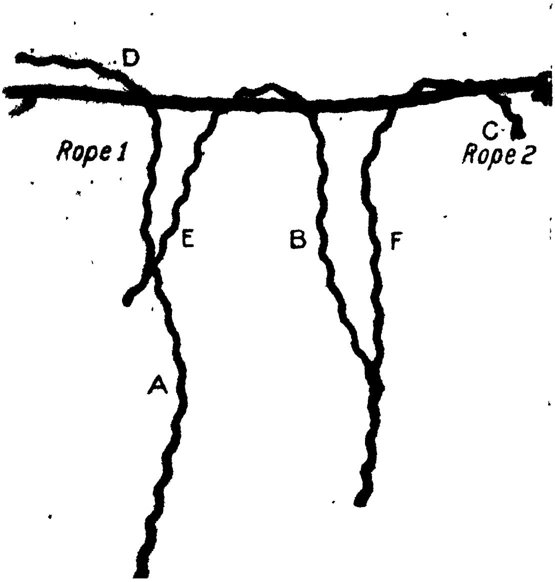


Fig. 6. Long Splice. The strands laid up into position, ready for finishing off.

Strands A, B, and C belong to Rope 1; strands D, E, and F belong to Rope 2.

Somewhere about three times the amount of rope used in the short splice (*i.e.*, about 2 feet in a 1¼-inch rope) is laid back, and the ropes are brought together in the same way. One of the strands of rope 2 is then further laid back, and its place taken by the corresponding opposite strand of rope 1. A strand of rope 2 then takes the place of the

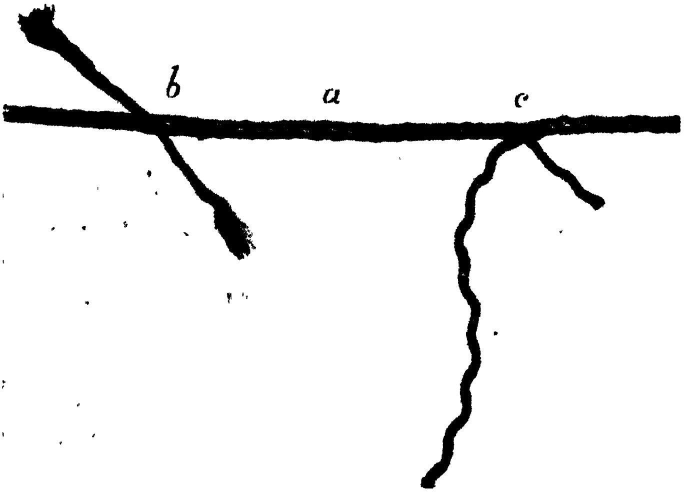


Fig. 7.—Finishing off Long Splice.

a. Two centre strands, woven and finished off. *b*. The overhand knot tied, ready for weaving. *c*. The two strands not yet touched, after laying up.

opposite and corresponding strand of rope 1. They should be laid up so far that there remains sufficient length to weave into the main rope in finishing off. Each pair of strands should now be equidistant from the pair that remain in the centre, though the ends, except in the centre, will naturally be of unequal length (Fig. 6.)

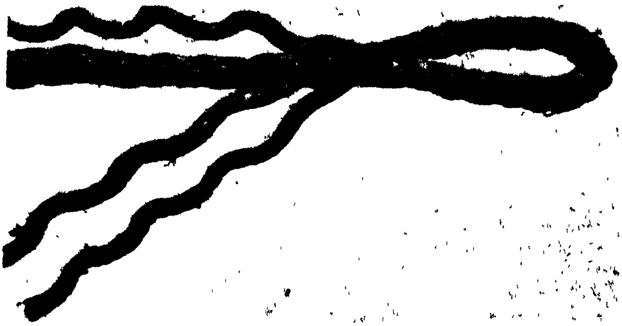


Fig. 8.—Commencing the Eye Splice. The middle strand turned under.

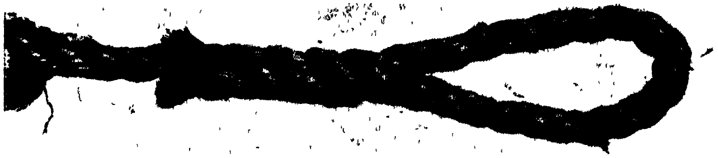


Fig. 9.—The Eye Splice finished. Not tapered.

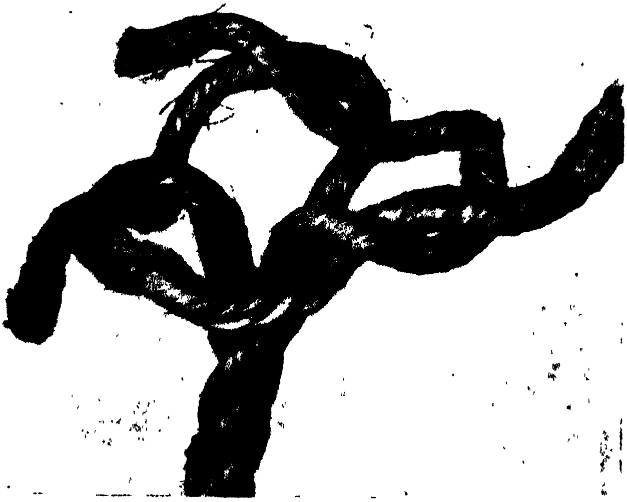


Fig. 10.—The Wall Knot, showing the position of the three strands before hauling taut.

There are a number of ways of finishing off. The most general is to take half or three-quarters of each strand, and tie with each pair an overhand knot, being careful that when finished each end still lies in the direction it did before. These six ends are then interwoven several times with the main rope, tapering them gradually off. The quarter or half strand that remains may also be interwoven with the rope, or else cut off, and the ends just tucked away. (Fig. 7.)

The splice must be very carefully made when it is to be used for rope belting, and every care taken to prevent the slightest "belly."

The Eye Splice.

The eye splice is easy to make, once the short splice has been mastered, and is very useful for leg-ropes, or wherever a running noose is used. It may be also made around a post or some similar object, but requires very careful manipulation to make it tight.

The strands are laid back as in the short splice, and the rope doubled to make the necessary sized loop. This loop is held in the left hand, while the strands, commencing with the middle one, are interwoven with the right. (Figs. 8 and 9.)

Two precautions must be taken in weaving—first, that the middle strand of the three comes over from the top of the doubled back portion; and secondly, that each of the strands is woven across and not with the twist of the rope. Special care must be taken of the latter when weaving the strand that is nearest the operator, as there is every likelihood of making a mistake at this point.

The Turk's Cap and Crown.

The ends of ropes will unravel very quickly if not prevented by some means. A common method is to lash the end with twine. This takes time, and necessitates the wherewithal to lash it. For certain work it may be an advantage to have a knob on the end of the rope, when a Turk's cap or wall knot is the most satisfactory. If, on the other hand, only a moderate thickness is wanted, the "crown" is made, and the strands spliced back two or three times, tapering if necessary.

The Turk's cap or wall knot is shown in Fig. 10. The strands are laid back, and each takes a

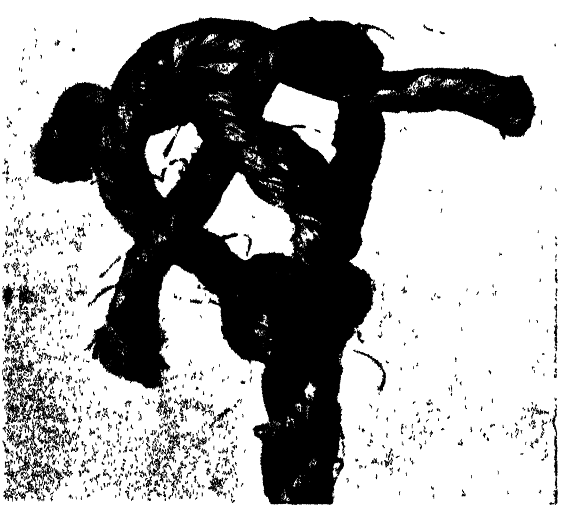


Fig. 11.—The Wall Knot below and the crown above, showing position of the three strands before hauling taut.

turn around its neighbour. The third strand, after taking a turn around the second, is inserted upwards through the loop made by the first strand, and all three are pulled taut. The ends can be cut off, but half an inch or more should always be left to flay out, and thus materially assist in preventing the knot from becoming undone.

For general purposes this is sufficient, but to make it more secure a crown is placed on the top by crossing the strands one over another as in Fig. 11, and hauling taut. The three strands are now all pointing downwards, and to make one of the most efficacious ends to a rope, these can be spliced back. The result is a large knob on the end, and to avoid this an excellent plan is to make only the crown, as shown in Fig. 11.

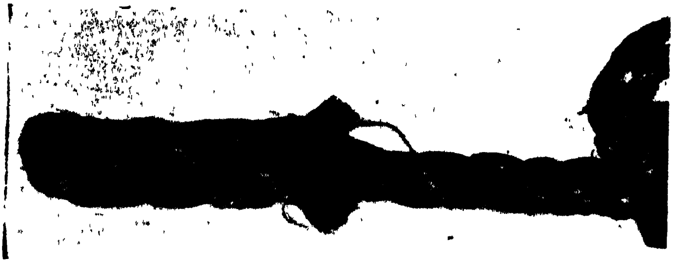


Fig. 12.—The crown made by itself, and the strands spliced back a short distance down the rope (not tapered).

By itself, the crown will not last, and the strands must be spliced back. (Fig. 12.) For convenience they should be tapered while being spliced, as this precaution will be found of very material assistance when drawing the end out of tight loops in undoing knots. All plough reins and halters should either be lashed, or finished off in this way.

The next section will deal with knots.

(*To be continued.*)

ADDITIONAL SKIN-IRRITATING PLANTS.

(See previous references in the *Gazette* for February and December, 1909, and December, 1911.)

1. *Olearia viscidula*, Benth., a native shrub-daisy, with white flowers, bears the extraordinary name of "Verbena" in the Tamworth district. It is coated with a sticky resinous substance, and since it is a useless plant, it is often hand-pulled, but the men (or, at least, some of them) doing the work suffer from a kind of skin-poisoning (dermatitis) as the result. Leather gauntlets should be used by men so affected.

2. "Vanillism" is a skin ailment in tropical countries, to which people who handle Vanilla are liable. See H. N. Ridley's "Spices," p. 66.—J. H. MAIDEN, Government Botanist.

Early Tomatoes at Hawkesbury Agricultural College.

JAMES ALFORD, Orchardist.

THE prices received for tomatoes raised at the College, and placed upon the market before the bulk crops come in, are so very satisfactory that a description of our methods should prove valuable. It is necessary to force the growth of the young plants during the winter months, and to protect them from frost; and it is also essential to plant them in the field, and prune them in such a manner as to ensure their ripening as early as possible; but the results more than justify the small expenditure and the considerable amount of light labour required.

We have sold £130 worth of fruit from a third of an acre of land. It is not our practice to dispose of all the fruit grown on this third of an acre, devoted to early tomatoes each year, as the needs of the College, with its staff, students and visitors, averaging more than 250 per day, have to be met first. Our very earliest tomatoes are not sold, but the price is ascertained at the date they are available, and the account for maintenance is debited with the value of all tomatoes supplied for College consumption.

The following prices were those actually received for tomatoes grown at the College, and sold through an agent at the Sydney fruit markets:—

Date.	Price per half-case s	d
30 November, 1911	8	0
4 December ,,	8	0
8 ,, ,,	7	0
11 ,, ,,	7 6	0 6
14 ,, ,,	6	6
18 ,, ,,	6	0
20 ,, ,,	6	0
27 ,, ,,	6	0
2 January, 1912	4	6
11 ,, ,,	6	0
15 ,, ,,	5	0

In November they were 10s. per half-case, but none were actually sold at that price, though a supply was available for College consumption.

These figures will show the return which may be expected from the labour devoted to the growth of early tomatoes. To a man who has a small area of sandy loam, handy to market, with facilities for irrigation and an adequate supply of farmyard manure, the industry offers a splendid chance. Probably there is no other crop which will give such quick returns from a small area.

The Method Outlined.

The dates upon which the several operations can be safely performed naturally depend upon the district. The tomatoes should not be planted out in the field until all reasonable danger of severe frosts is passed. Consesequently, an "early" district has an advantage over a "late" one. Ours is not an early district by any means, as the belt of country in which the College is situated is far more subject to frost than, for example, the lower part of the Hawkesbury Valley.

Our seed is sown about the middle of July, in seed-boxes covered with glass and placed in a hot-bed, where the growth of the young plants is forced, and they can be covered from frosts at night. When the plants are about 2 inches high they are transplanted into 3-inch pots, and the pots are plunged into the hot-bed, where the young plants can still be protected at night. About the third week of September they are set out in the field. If the weather looks threatening after that (a peculiar hardness in the air generally indicates a coming frost), a ti-tree bush is placed on the south-west side of each plant. The tomatoes are grown on trellises, 4 feet or 4 feet 6 inches apart, and are placed 15 inches apart in the rows. They are pruned to one main stem. The average yield is about 20 lb. of fruit per plant, and, as indicated above, the first fruit is ripe towards the end of November.

Now for the details.

Varieties.

The variety always used for early fruit at the College is Spark's Earliana. This is a very good tomato, fairly smooth and round, and admirably adapted for trellising and pruning. In a number of comparative trials at the College it has always come out best for early fruit.

Burwood Prize, a tomato largely grown, is not suitable for this purpose. Its growth is very sturdy, and it is not adapted for trellising; and, moreover, it is not nearly as prolific as Earliana.

Dwarf Champion is a good bearing variety, and does not require staking. It is used at the College for midseason sowing for main crops. As tomatoes are cheap in season we do not attempt to trellis or prune this variety.

For late fruit, in a district suitable for such crops, Spark's Earliana could be used again. We do not attempt the winter crops, our latest tomatoes being picked about the middle of May. These are Dwarf Champions, and the seed for this is sown late in January.

To sow half an acre of Spark's Earliana, 2 ounces of seed will be found sufficient.

The Hot-bed.

For half an acre of tomatoes the hot-bed will need to be about 24 feet long by 6 feet wide, if it is proposed to set out the plants about 2 inches apart each way without pots. If 3-inch pots are to be used, which we practise and recommend, the hot-bed will need to be proportionately larger for the same area of tomatoes.

A few loads of fresh stable manure are put in a heap, and allowed to heat for about a fortnight. When quite fresh it heats too rapidly, and will burn the plants, so it should be allowed to ferment a little before use, and turned over at least once to regulate the heat. This should be spread out evenly to a depth of 2 feet on the surface of the ground facing, for preference, the north-east. The quantity of manure required can be gauged from the size of the hot-bed proposed to be made.

Around the hot-bed, build a frame of battens, 2 feet high at the back, and 18 inches high at the front above the level of the manure. Cover the sides and ends with bagging or other such material. Over the top, place a hessian blind fastened at the back, and at the front put a long piece of round wood, upon which the blind can be rolled back to admit sunlight and air. Glass is largely used for covering the frames, but we find the hessian blind quite as satisfactory and much less expensive. The blind is let down at night to protect the plants from frost, and rolled up in the morning. (See Fig. 1.)

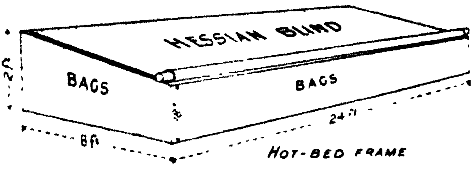


Fig. 1.

The Seed-boxes.

These may be made from kerosene cases. One side of a case is removed, and the top closed so as to give a flat box about 10 inches deep. Put 3 inches of rotten manure or similar material in the bottom for drainage purposes, and then 3 inches of nice, free, sandy soil. This will leave about 4 inches of space for the seedlings to grow. Sow the seeds in the box, and place a sheet of glass over it in order to exclude the cold air. Plunge the box into the hot-bed, so that the heat may germinate the seeds. Draw down the hessian blind each night. As the plants come up, the glass cover is gradually tilted back to give ventilation, until eventually it is removed altogether.

Four such boxes will be enough for half an acre of tomatoes.

The seedlings must be taken out of the boxes as soon as they are strong enough—generally when about 2 inches high. If left too long they will grow spindly and possibly "damp off."

Planting in Hot-bed.

The practice of pricking the young seedlings into 3-inch pots, and plunging the pots into the hot-bed, is preferable to planting direct into the hot-bed. The advantage is that the plants can afterwards be turned out of the pots into the field without suffering any check. In case the pots are not available, however, 4 inches of soil may be put on top of the hot-bed, and the seedlings planted out 2 inches apart. This will necessitate much care when planting in the field afterwards; otherwise the plants may receive a severe set-back.

In the hot-bed, whether in pots or not, the plants should be shaded from the bright sun for three or four days after setting out. Then all shading is removed by day, but at night the hessian blind is let down to protect them from frost. The tomatoes are kept under shelter in this way until all reasonable danger of severe frosts is gone.

Trellising.

As already stated, the plants are put in trellised rows 4 feet or 4 feet 6 inches apart, and 15 inches apart in the rows. The trellises at the College are made of 3 inch x 2 inch or 3 inch x 3 inch posts, 9 feet apart, with light 2 inch x 1 inch battens nailed to them, and laths fastened perpendicularly every 15 inches. But where a man has land in such a position that long rows can be laid out, it will be cheaper to use wire to support the laths. Posts can be placed 18 feet apart, and two wires run—one a foot from the ground and the other 4 feet above—so that the top wire is 5 feet from the ground. The posts, of course, need not be of sawn timber. Then the laths may be fastened to the wires every 15 inches with string or tie-wire (see Fig. 2). Builder's laths, bamboo sticks, or light saplings will do for the laths. They should be long enough to extend from the ground to well above the top wire. Stout wire is sometimes used for laths, but this often burns the plants in hot weather. A tomato plant is set out at the base of each lath.

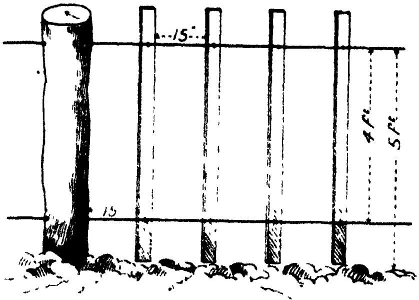


Fig. 2.

After planting out, we watch the weather for late frosts. In such cases our practice is to put a ti-tree bush on the south-west side of each plant. This shelters the plant from the cold winds, but leaves it open to the sun on the north. We have never lost any tomatoes by frost.

Pruning.

This is the most important operation in the whole process. It is no exaggeration to say that, by careful pruning, tomatoes can be made to ripen a month earlier than they otherwise would.

All lateral growth of shoots is pinched off, leaving only the main stem, which is trained up the lath. A lateral shoot starts from just above a leaf on the main stem. The leaf must not be interfered with, but the shoot pinched off as close to the stem as possible without damaging the leaf (see Fig. 3).

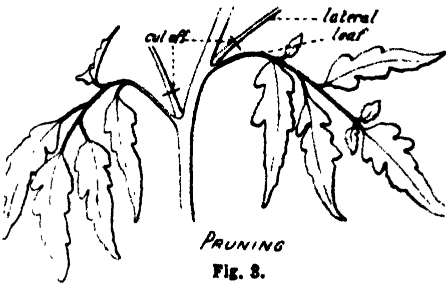
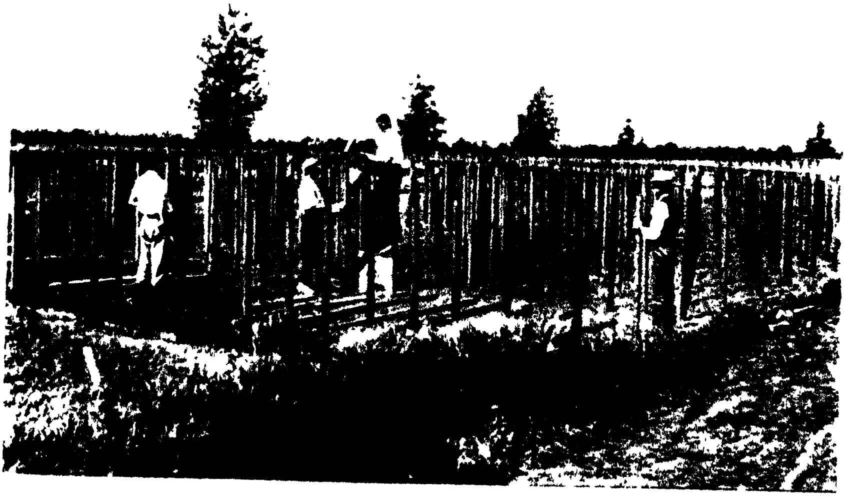


Fig. 3.

Erecting the Trellis.



Another view of Trellis.

EARLY TOMATOES AT HAWKESBURY AGRICULTURAL COLLEGE.

General view of the Tomato Vines.

Showing Individual Vines.

EARLY TOMATOES AT HAWKESBURY AGRICULTURAL COLLEGE.

The trusses of bloom which give the fruit are thrown out along the main stem. Care must be taken not to injure these when pruning. When the main stem reaches the top of the lath it may be pinched off, but not before. This pruning should be practised regularly, about once a week. Wherever laterals appear they should be pinched off.

The tomatoes will start to ripen from the base of the plant, and the ripening will proceed gradually towards the top.

Watering.

The tomatoes, whether in the seed-box, hot-bed, or in the field, must be regularly but not excessively watered. The soil should be kept always in a moist, growing condition. Harm can be done by too much watering, but soil should never be allowed to get dust-dry. At the College we irrigate tomatoes and vegetables with the effluent from the septic tank.

If there is danger of frosty nights, the best practice is to water the young seedlings in the mornings. If the plants are watered in the evening and a cold night follows, the plants will receive a check. In warm weather, however, watering at night is the rule.

Spraying.

Our early tomatoes are sprayed occasionally to prevent Black Spot, using Bordeaux Mixture at the summer strength. This is prepared from copper sulphate, 6 lb.; lime, 4 lb.; water, 50 gallons. Leaflets giving full directions may be obtained from the Department of Agriculture.

If the weather is wet, we may spray once a fortnight; but in fine weather it is not necessary to spray so often

Conclusion.

It will be seen that the growth of early tomatoes is an industry which gives large returns from a small area, and one which requires the expenditure of very little capital though a good deal of labour. This class of agriculture is one which has not yet been developed in the "land of great distances," but we are fast approaching the time when land close to large markets will be valued for its total productive capacity. In the meantime these notes may be of use, not only to those who may wish to make a complete living from the industry, but also to those who love this delicious fruit-vegetable, and wish to have a supply for household use at a time when fresh tomatoes are obtainable in the market only at fancy prices.

The Starling.

A STUDY IN AGRICULTURAL ZOOLOGY.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

VARIOUS European birds were introduced into Australia many years ago, when the Englishman, in sentimental mood, wished to see the birds of his boyhood days around him; and some well meaning but misguided persons introduced the sparrows, blackbirds, and most of the song-birds. Among these birds was the common starling. It landed somewhere on the shores of Hobson's Bay, and soon made its way into the city and suburbs of Melbourne, where it was firmly established over thirty years ago. There may have been a special importation from England, but I think that the ancestors of the present Sydney starlings were brought from Victoria.

In the days when acclimatisation was in the air, Australian birds were not considered in any way interesting. Even as far back as 1843, Assistant Surgeon Bartlett ("New Holland, 1843") wrote:—

> At night no more he hears the delightful warblings of the queen of songsters—the charming nightingale. The hoarse croaking of the offensive bull-frog, and the incessant buzzing of the hideous mosquito, he takes in exchange for the gladdening tones of England's fairy songsters.

Mr. R. H. Horn voiced this un-Australian feeling in "Australian Facts and Prospects," published in 1859, wherein he bewails the fact that the ugly gum-trees spoilt the beautiful park-like land near Melbourne, and says "if they could all be cleared away, and replaced with oaks, elms, &c., the landscape would be greatly improved."

The starling was known in old England as the "stare" or "starred," "starling" being the modern name of this bird. The members of the starling family belong to the genus *Sturnus*, of which the common starling (*Sturnus vulgaris*) is a typical form, breeding throughout the greater part of temperate Europe.

It is one of the most adaptive of what we might call domestic birds, and not only has it extended its range across Asia to Japan, but it has travelled downward, over the Mediterranean, to the southern parts of Africa, while it has also found its way to the Canary Islands, the Azores and Madeira.

Artificially it has been introduced into Tasmania and New Zealand, as well as Australia, and wherever it comes it remains a settled resident.

The common starling is not found in North America, but its place is taken by a closely allied form that was once known under the scientific name of *Sturnus praeditorius*, and has many popular names which denote its destructive habits, such as the "Corn-thief" or "Rice Bird," though another popular name, the "Red-winged Blackbird," defines it much better. This is the Bob-o'-Link of the popular natural history books of the United States which, as the Rice Bird, plays such havoc with the rice and grain fields of the north in summer, migrating in millions to South America at the approach of winter.

We have one native representative of the family, the Glossy Starling (*Calornis calybeius*), which ranges from south-eastern Asia through New Guinea into Northern Australia. Its coat is jet black, with an intense metallic green gloss that gives it a very distinctive character.

The Starling in Great Britain.

In olden days in England, the starling was looked upon as a friendly domestic bird that did much good and comparatively little harm. In Knight's "Cyclopædia of Natural History," published in 1856, the editor says:—

> Common starling or stare, one of the handsomest of our birds, and a general favourite. It is intelligent, sprightly, and has a retentive memory, and when kept in confinement the male learns to whistle tunes and imitate the human voice.

In Morris' "British Birds," there is no mention of the starling doing any serious damage to fruit or crops, though it is stated, when noting its food, that it includes grain, fruit, and seeds.

Theodore Wood, in his "Farmers' Friends and Foes," 1888, in reference to the starling says:—

> Save that it is a little too fond of ripe cherries, indeed, and will sometimes make free with a little fruit of other kinds as well, I know of no accusation that can justly be brought against it, and this fruit is a very trifling price to pay for the services of the bird in the way of insect destruction. The starling, in fact, is one of the greatest of all the farmer's friends, the counterbalancing mischief which occasionally mars its services being in most cases so small as scarcely to be worthy of mention.

However, in the latest work dealing with the starling in England, "Harmsworth's Natural History," 1911, we find that conditions at the present time, for some reason or other, are quite altered. The authors say:—

> The starling is one of the most adaptive of birds, in consequence of which its range is steadily increasing, especially in the British Isles, in which its numbers have augmented of late years to an extraordinary extent

Noting its insectivorous qualities, they go on to say:—

> At the same time, account should be taken of the heavy loss which fruitgrowers sustain from the inroad of hordes of hungry starlings, the extraordinary numbers of these birds which visit orchards of ripe fruit almost defying description. Recently the starling has developed a special fondness for ripe pears and apples, and does not altogether disdain wild fruit, even the berries of the rowan or mountain ash being much to its taste. When feeding on grass lands, in company with thrushes, the starling is apt to play the part of a bully, robbing gentler neighbours of their fairly earned subsistence

The Starling's Voice.

The starling is remarkable for its wonderful flow of bird language, and though the usual note when feeding on the lawn, or foraging in the fowl-yard, is a somewhat harsh chuckle, they cultivate a great variety of notes. Hall and Gillies, in their "Nature Studies in Victoria," describe them well as follows:—

> One bird called plaintively as if in trouble. The call of another suggested the not unpleasant sound of a good violinist tuning his instrument. In a third call we heard the slight crack of a child's whip, and in still another the harsher sound of a boy's rattle.

> Then we were startled to hear a spirited imitation of the blue wren's notes. But the leading note, the note most characteristic of the starling, was one which suggested the breath drawn in with a musical sound.

Dr. Bowdler Sharp, in the "Royal Natural History," tells how the starling mimics other birds. He says:—

> We have heard individual starlings reproduce the call note of the skylark, goldfinch, wagtail, and other small birds. Sometimes we have been startled on a winter's day to recognise the cry of the common sandpiper, or the grating call-note of a fern owl, in the middle of a crowded city, and have discovered the author of our astonishment in the person of a starling that is pouring forth his rhapsodies from some neighbouring chimney.

It was, and perhaps may still be, a common practice on the Continent to keep the starling as a talking cage bird. Years ago it was a cruel custom to sear their eyes with a red hot wire, under the impression that blinded birds always talked best.

Readers will remember the pathetic chapter on the starling, in Lawrence Sterne's "Sentimental Journey in France," where he says:—

> On my return through the passage I heard the same words repeated twice over, and, looking up, I saw it was a starling hung in a little cage. "I can't get out, I can't get out" said the starling. The bird flew to the place where I was attempting his deliverance, and thrusting his head through the trellis, pressed his breast against it as if impatient. "I fear, poor creature," said I, "I cannot set thee at liberty." "No," said the starling, "I can't get out; I can't get out."

Pliny says that the two Cæsars, Germanicus and Drusifus, had a stare and sundry nightingales taught to speak Greek and Latin. "Moreover, they would study on their lessons, and meditate all day long, and from day to day come out with new words—yea, and were able to continue a long speech and discourse."

The question of the value or otherwise of the starling from an economic standpoint is such a vexed one that it is well worth considering, and the writer proposes to place both sides of the question before the readers of these notes.

A Domestic Pest.

In the suburbs of our large cities, and some of our country towns, the starling has become such a domestic bird, that it often tumbles down the chimney and startles the inmates of the house. It is domestic, or rather too familiar, in its nesting arrangements, for it carries a mass of sticks, grass, and other material into the roofs of houses, wherever it can find an opening large enough to squeeze through; consequently, where starlings are numerous, as in the neighbourhood of Melbourne and Sydney, they soon form large accumulations of these nesting materials. These heaps then become infested with a minute semi-transparent mite, which lives upon the birds themselves; and under favourable conditions the mites increase in such numbers that they often spread throughout the house, and getting into the beds and clothes of the occupants, cause a great deal of annoyance and pain by biting and sucking blood. From its minute size and colourless body (until it has sucked some blood), this mite is very difficult to detect, and it is not an uncommon thing in Sydney for a doctor to be called in to examine the suspicious red rash caused on delicate skins by the objectionable starling mite.

The only way to cleanse the house thus infected is to get rid of all the rubbish in the roof, close up all openings through which the birds can enter the eaves, and thoroughly disinfect the whole place.

In the suburbs they also, with their friends the sparrows, eat a lot of food and scraps in the fowl-yards, and thus are, to a certain extent, depredators on the poultry-keeper.

An Orchard Pest.

It is in orchards, however, that they do so much damage; but around Sydney they have not become such notable pests as in Victoria, probably because the class of fruit grown in the area around Sydney consists chiefly of apples and citrus fruits. It is also a well-known fact that they have hitherto been more numerous, and were established at a much earlier date in Victoria than in New South Wales.

Within the last few years there has been a very marked increase in their numbers about Sydney, and they are spreading in all directions into the country districts, so that they will be a great factor either for good or for ill in the near future.

Admitting that the starling does destroy insect pests in Australia, as it is still credited with doing in Europe in the winter months—it is not of much advantage to the orchardist if the starlings destroy his fruit crops in the summer, for as a general thing the insect pests would have left him something.

The Dutch Naturalist, Dr. J. Retzema Bos, in his "Agricultural Zoology," says:—

> Very serviceable. Devours, especially in autumn, many field snails; also cockchafer grubs, wire worms, grass caterpillars, grasshoppers, leaf lice, and many insects destructive to fruit trees. The starling, however, is able to do considerable damage to garden fruit, since it eats cherries, currants, and sometimes even peas.

Last year it was reported in the British agricultural papers that the starlings were more numerous in the eastern counties than they have ever been in modern history. Millions of starlings and thousands of birds of other species have ruined many wheat crops. Here also there is no advantage to the farmer, if the starling eats both insect pests and his crops.

Prior to 1904, the starling, with other introduced birds, had been protected in Victoria, but owing to the reports of the increase of these birds in the suburban areas, and their spread into the fruit orchards beyond, the Minister of Agriculture (Mr. Swinburne) sent a circular round to the various councils, fruit-growers, and horticultural associations, asking for their advice as to whether they considered the starling a pest or otherwise. This led to a large amount of correspondence, in which all the people interested in fruit were emphatic in their condemnation of the starling. Several pointed out that while the starling was insectivorous during the winter months, it was a most destructive pest in fruit orchards, not only eating up all the smaller fruits, but pecking holes in the larger fruits, and spoiling them for market. In such districts as Doncaster, Somerville, Pakenham, Ringwood, and Yarra Glen, they were said to eat nearly every kind of fruit in the orchards, and cherries had to be watched from the time they first began to colour until they were ready to market. A few associations in Gippsland and other farming districts claimed that the starlings were their best friends, and killed many insects, particularly caterpillars, cut-worms, and grasshoppers.

Mr. C. French, jun., writing upon fruit-eating birds in the *Victorian Journal of Agriculture*, 1905, gives a brief account of the starling. He says:—

> There can be no doubt about the starling being a most pernicious enemy to the fruit-grower and viticulturist in this State. The starlings are increasing a thousand times faster than their natural food; hence they must avail themselves of such as is obtainable.

From the evidence placed before him, the Minister offered to place £500 on the Estimates to aid in the destruction of the starlings, if the Councils would pay half the bonus of 6d. per dozen for starlings' heads; but difficulties cropped up, and this form of bonus was dropped. The Victorian fruit-growers in starling-infested areas are just as positive at the present time that the starling, as far as they are concerned, is one of their most serious foes.

In the March number of the *Agricultural Gazette* of Tasmania are published the results of the discussion raised at the meetings of the country Boards of Agriculture, "Should starlings be protected?" We find that eight of the associations declared that the starling was more beneficial than otherwise, and several Boards reported in favour of their being protected. Colonel Legge, hon. secretary of the Agricultural Board of St. Mary's, went so far as to say that starlings were purely insectivorous; that they had acquired the habit of eating fruit in Tasmania, and also the objectionable habit of nesting in the chimney-spouts and roofs, because they had been liberated in the towns and not in the country. Such statements are certainly not borne out by the investigations of their habits at the present time in England. In one report—that of the Tamar Farmers and Fruitgrower's Association the starling was recorded doing much harm by attacking fruit and sprouting grain; but this was qualified by the following statement:—

> But they rendered yeoman service in other ways, as grub exterminators, being especially helpful in mitigating the grass grub pest.

This is a remarkable example of the same bird under different conditions developing different habits, for while a bonus is being paid for starlings' heads in Victoria, just across the Straits in Tasmania the farmers are advising their protection.

The Starling and the Sheep-Maggot Fly.

Within the last few years the increase in the starling population of our towns has led to a striking migration of these birds in large flocks from the town into the country. In the southern and south-western districts these flocks have been observed among the sheep on the plains and have been seen upon their backs picking off the ticks. This is a common habit in Europe. Retzema Bos, previously quoted, says:—

> Starlings often settle on the backs of sheep and cows to pick off the vermin.

It has been noticed also in Victoria. The secretary of the Casterton Pastoral and Agricultural Society, writing in 1904 to Mr. French, said:—

> Nor is the damage confined to fruit-trees, but in flocks of sheep, they alight on the sheep's back, and hurt the evenness of the wool to a great extent. It has been noticed that so terrified are the sheep when a flight of starlings approach that they run away as though rounded up by dogs.

This new migration into the farming and pastoral districts of this State has brought the starlings very prominently before the public, and a great many letters from residents in the country have been published in the newspapers, leading to further comment. Farmers have claimed that they were destroying the sheep-maggot flies, and have extolled the starlings as the solution of this serious insect pest. Thus far, little actual evidence has been brought forward to substantiate these general statements; though on the southern tablelands it is claimed by some landholders that they are an effective check upon the sheep-maggot fly, that for the last few years has been doing so much damage to the sheep and wool industry.

From an extended study of blow-flies and their maggots, in conjunction with careful observations upon the habits of the starlings, I am very doubtful whether these birds make any appreciable difference in the numbers of blow-flies and their maggots. Starlings, when hunting for insects and such animal food, find it upon the ground. Caterpillars, cut-worms, beetle grubs, grasshoppers, and other ground-haunting insects are their natural food, together with seeds and fruits when obtainable. They do not catch flies, which even when resting on the ground are too alert to allow a bird like the starling to catch them. The more or less clumsy starling is not built like a fly-catcher, and would have considerable difficulty in snapping up a fly if it were resting on a sheep's back.

It is therefore only in the immature or maggot stage of these destructive flies' existence that we can count on the assistance of the starling. They will certainly pick up any exposed maggot dropping from the sheep on the ground; but the maggots that hatch from the eggs deposited on the surface of the fleece are soon out of their reach. These tiny maggots, too small when first hatched to be gathered into the starling's stout beak, waste no time, but work their way through the fibre of the wool right down to the skin, and are under the protection (in a full fleeced sheep) of the close wool before they are any size. Therefore, to obtain a supply of maggots of a reasonable size for food for a bird as large as a starling, the bird would have to delve into the wool for a considerable distance, or else tear out the wool above them. Now, as far as I have personally observed their actions, and from everything I have read, the starling does not fossick into the wool, but simply picks things off the surface.

So far there has been no positive proof given by anyone that the starling, when he becomes a bushman, destroys sheep maggot or other allied species of flies. The only way to obtain reliable evidence of its value or otherwise as an insectivorous bird in this particular line, would be to shoot half a dozen birds during their feeding hours among the sheep and cattle (we know quite well what they find in the gardens and back yards). These birds, or their stomachs, the latter for preference, could be placed in a 5 per cent. solution of formalin in small bottles, and forwarded to the Entomological Laboratory, when their contents could be tabulated.

The Future of the Starling.

The most important question arising from the migration of the swarms of starlings into our bush lands is what the effect will be upon our many useful native insectivorous birds that, in spite of indiscriminate poisoning of rabbits and other dangers attendant on the advent of civilisation, still carry on their work in orchard, field, and forest. We have shown the wonderful adaptive power of the virile starling to invade new lands and multiply under all kinds of climatic conditions. It may happen that the invaders may become the sole feathered occupants of our bush lands, and the greater portion of our wonderful native bird fauna may be banished from the face of Australia. Hordes of hungry starlings competing for the food supplies, often circumscribed in winter months and times of drought, will soon clear up the local insects, seeds, and berries of our bush, and all native birds with similar food habits will have to go hungry, and finally give way to the aggressive intruders. Then, again, they will dispossess our birds of their nesting places, and, not counting our smaller birds, even the laughing jackass, magpie, shrike, &c., will run short of suitable nesting grounds. It is also stated on good authority that starlings do not turn up their beaks at the eggs of any other birds when they find them unprotected; and that they turn birds out of their nests to occupy them, if suitable in size and location.

In conclusion, it is not what the starling is doing at the present time that is open to question, but what he may do in the future, even allowing that he is only a pest in some districts, and that in others he pays for the damage he does to the fruit orchards by policing the gardens and fields. Given a free hand, a virile, adaptive, aggressive bird of this type, with no natural enemies, living in a land of almost perpetual summer like the greater part of Australia, where there is no necessity for an annual migration with its attendant dangers, there is no restriction on an excessive increase in their numbers. Where will they stop? When all the insects are gone, they will not starve, with the wheat-fields and cultivation paddocks at their mercy: and, as has been shown in Victoria, when once they acquire the habit of fruit-eating, these omnivorous birds do not trouble about insects. It may be the same with the wheat, and it will not surprise anyone who has given the matter close attention if the migration of the starling into the country does not in the near future mean another very serious and far-reaching pest to the great wheat-fields of Australia.

There is certainly no reason to extend any protection to the starling by Act of Parliament. If he proves himself a destroyer of the sheep-maggot flies, the sheep-owners will see to his protection far better than any law can do the work.

Budding the Vine.

M. BLUNNO, Viticultural Expert.

THE system of grafting vines generally known and accepted is practised at the end of winter or early in spring. The stem of the vine to be grafted is cut off level with the ground, and a scion inserted into a cleft made in the stem; or if the vine to be grafted is but 12 months old, and the stem about the thickness of a vigorous cane, the whip and tongue graft is used instead.

I shall deal in this article with a system of grafting which is really "budding," but it is a different kind of budding from that often attempted on the vine, and ever attended by failure. The system of budding adopted for roses and fruit trees seldom if ever succeeds when attempted on the vine. The method which I am about to describe is based on the same principle, but varies in its details. The drawings will avoid the necessity of much explanation.

This system of budding was called the "flute-graft of the vine" by the late Signor Sante Caravella, Foreman at the Royal Viticultural Station, Palermo, Italy, who, after a series of experiments in vine-budding, gradually improved on the old one, which was hardly ever attended by success. The name adopted to indicate this method of grafting is perhaps not entirely illustrative, it being somewhat different from the real flute graft adopted in the case of certain trees—*e.g.*, the chestnut. However, we will accept the name as more indicative than illustrative.

The reconstruction of vineyards on Phylloxera-resistant stocks, in which a large number of growers are engaged throughout nearly all the vine-growing countries of the world, made the question of vine grafting a very important one, because the European vine is grafted on a stock which truly is also a vine; but it is a vine originating in another continent. Botanically they are close to one another, but not identical; they belong to different genera.

Persons interested in the viticultural industry have heard often enough that, in the reconstruction of vineyards on Phylloxera resistant stocks, care must be taken that a suitable kind of stock is planted which adapts itself to the soil, and also that there should be affinity between stock and scion. Those engaged in the work have met with various difficulties, and some of the difficulties encountered, as some of the failures recorded, were wrongly put down to causes often wide of the mark, but evolved to give some plausible reason for the failure, or partial success, of the reconstruction. Many vignerons would more easily and directly find the reason by examining that part of the vine where the grafting was done. The time-honoured system of grafting the vine is good and irreproachable from the theoretical as well as from the practical point of view. Nevertheless, when the devastation caused by Phylloxera rendered it necessary to graft several thousand millions of individual vines within a relative short number of years, it was then found that, in addition to the want of affinity between certain kinds of resistant stocks and certain varieties of vines, there was, and there is still, another difficulty, viz., that connected with the necessary skilled labour to do the operation neatly and carefully. The operation, although of a very simple kind, requires a certain amount of patience and practice. When vinegrowers in Europe had before them the gigantic task of having to reconstruct millions of acres on Phylloxera-resistant stocks, the genius of a few of them evolved several new systems of field and indoor grafting, some of which got the sanction of experience, and these, if they have not come into general use, at least have been adopted in special districts, where the man who conceived the idea popularised the system among his neighbours.

These two questions—the adaptation of the resistant stock to the soil, and the affinity between stock and scion—are often considered the two principal ones on which depends the successful reconstruction of a vineyard. Having had many years of experience, I would say that reconstruction also depends largely upon a good and suitable method of grafting, as well as upon the number of vine dressers skilled in the operation that are available in the district.

Budding can be done on a vine-rootling as well as on an older vine.

Budding Old Vines.

On an older vine the operation is carried out as follows :—

Take a vine shoot of the ordinary European vine, from which all the side shoots were nipped off when just starting to grow—that is, when not more than 1 inch long (see Fig. 1). With a sharp budding knife make a cut right round, three-quarters of an inch above, and another below a bud ; also a cut lengthwise opposite to the bud. Lift the bark with the ivory handle of the knife, and remove the cut section of the bark carrying its eye (see B, Fig. 1). The same operation is done on a shoot of the Phylloxera-resistant vine (Figs. 2, A ; and 3, A 1).

The bud of the European vine, with its section of the bark, is then placed on the denuded section of the shoot of the resistant vine, fitting the bud on the spot from which the bud of the American vine was removed (Fig. 2, B 1, A 2), and covering the section of the wood denuded of its bark with the bark of the European vine, so as, if possible, not to leave any part of the wood unprotected. It follows that the shoots of the European vine which serves as scion, and that of the resistant vine serving as stock, should if possible have the same diameter, so that the bark of the former shall completely cover the denuded wood of the latter right round. If the shoot of the European vine be somewhat smaller in diameter, then in removing the bud and bark from the shoot of the resistant vine a small strip of bark is left (See Fig. 2, A) in the position opposite to the bud. This strip should never be larger than one-fourth of the circumference of the shoot. In other words,

BUDDING THE VINE.

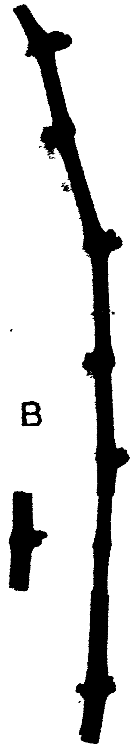
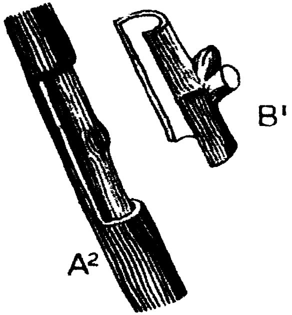


Fig. 1. - Removing bud from European shoot.



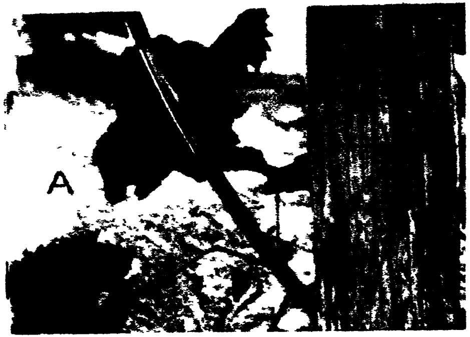


Fig. 2. - Bud removed from shoot of Phylloxera-resistant stock.

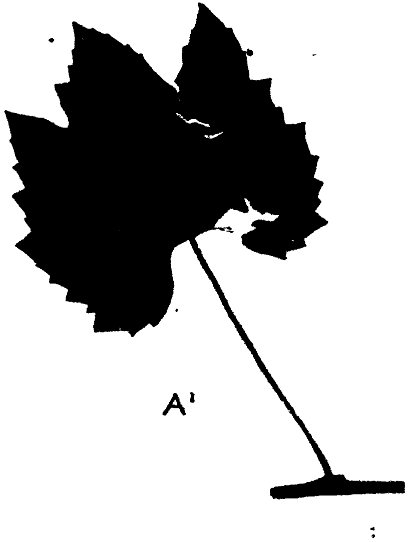


Fig. 3.— Bud of resistant stock removed.

BUDDING THE VINE.

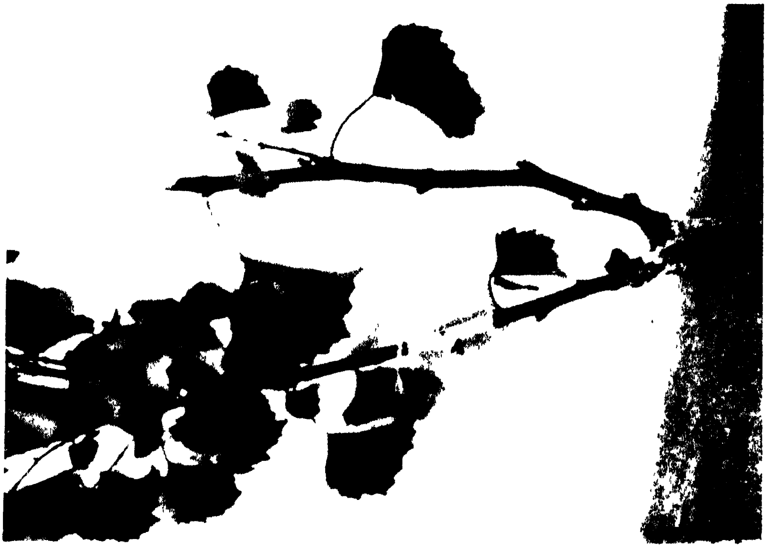


Fig. 4. Black Muscatel budded on Rupestris du Lot.

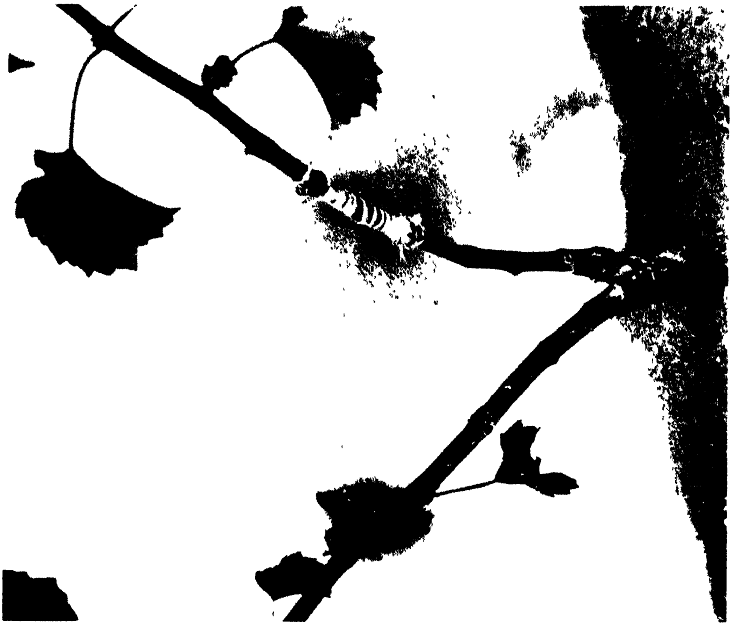


Fig. 5. Showing ligature cut on graft.

if the bark of the European covers less than the three-fourths of the circumference of the shoot of the resistant vine the operation will fail. The European bark should at least coincide on one side with the strip of the bark of the resistant vine.

Then raffia or wool is wound round the graft (Fig 4). The ligature should be close and tight, so as not to leave interstices, and should also be extended about one eighth of an inch beyond the top and bottom ends of the operated section. The ligature near the bud should fix the bud tightly on the small wooden knob on which the bud of the resistant vine rests. Naturally the European bud is not covered by the ligature; on the contrary it should remain quite free and unhampered. The ligature is wound near the bud, so as to catch it in a V.

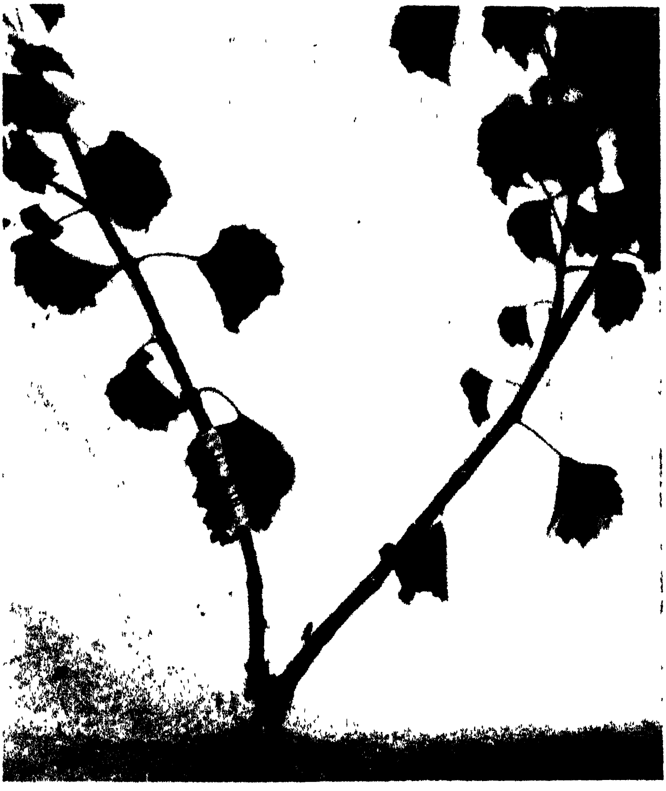


Fig 6.—Black Muscatel budded on Rupestris du Lot.

As the operation is carried out in summer, a vine leaf is placed round the section thus treated, in order to protect it from the direct sun for the first few days. A fortnight later the top and bottom hoops of the ligature are cut, to ease the ligature as the shoot grows in thickness, and to prevent strangling (Fig. 5). A week later a longitudinal cut is made on the ligature, but it is left in its place; the shoot as it grows in thickness will shell off the ligature.

For the success of the operation, it is not necessary to place the European bud on the place from which the bud of the resistant vine was removed, but it may be put on the wood between the two knots.

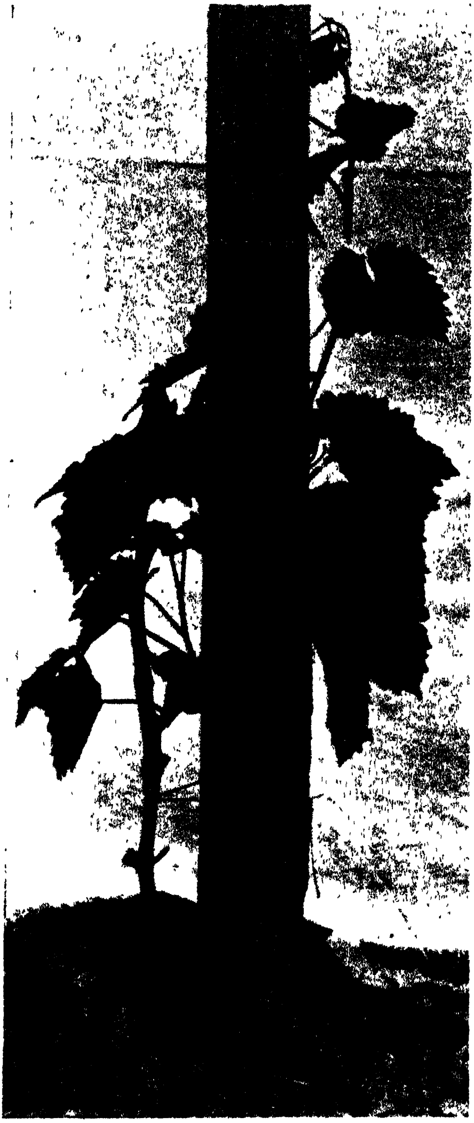


Fig. 7.—Budded vine shooting.
Mr. H. Dreis' Vineyard, Fairfield.

Not only can more than one bud be put on the same vine, but on the same shoot of the resistant vine more than one bud can be placed. A grower who wants to produce budded cuttings can place buds at a distance of 15 to 18 inches apart on the same shoot. To do this, the shoots of the resistant vine are run up to a tall vine stake, so to avoid their twisting and bending. At pruning time the shoot is cut into lengths, taking care to leave on top of the European bud the full length of a merithal, with a bud of the resistant vine, which bud is removed before planting. This operation is called "stagging."

I have described the system of budding when it is desired to leave the bud dormant—that is to say, when the bud will sprout in the following spring. However, the bud placed in summer can be made to shoot in the same season. All that is required to obtain this is to cut the shoot off 6 or 7 inches above the bud, after making sure that the bud has taken. A fortnight after the shoot has been so cut off, the bud begins to sprout, and by the time the vegetative period ends, the shoot from the European bud will have attained a considerable development in length, diameter, and general vigour (See Figs. 7 and 8).

Preparing for Budding.

The vigneron intending to adopt this form of grafting on vines should begin by suckering the Phylloxera-resistant vines in the early spring, and also by thumb-pruning all superfluous shoots, leaving only four or five, and should tie these upright to a stake. If the stock is very young, then only one or two shoots are left, so that they may attain sufficient vigour; all the others are removed. Then all the side shoots, or second growth on the remaining shoots, should be nipped off as soon as they show themselves. They should not be allowed to grow more than an inch or two before they are pinched off; otherwise the bud and bark cannot be removed clean off. The European vines from which it is intended to take the buds must be likewise attended to; the shoots that will supply the buds must have the side shoots nipped off as soon as they appear. If this is neglected then the side shoots grow too tough, and the bud with its section

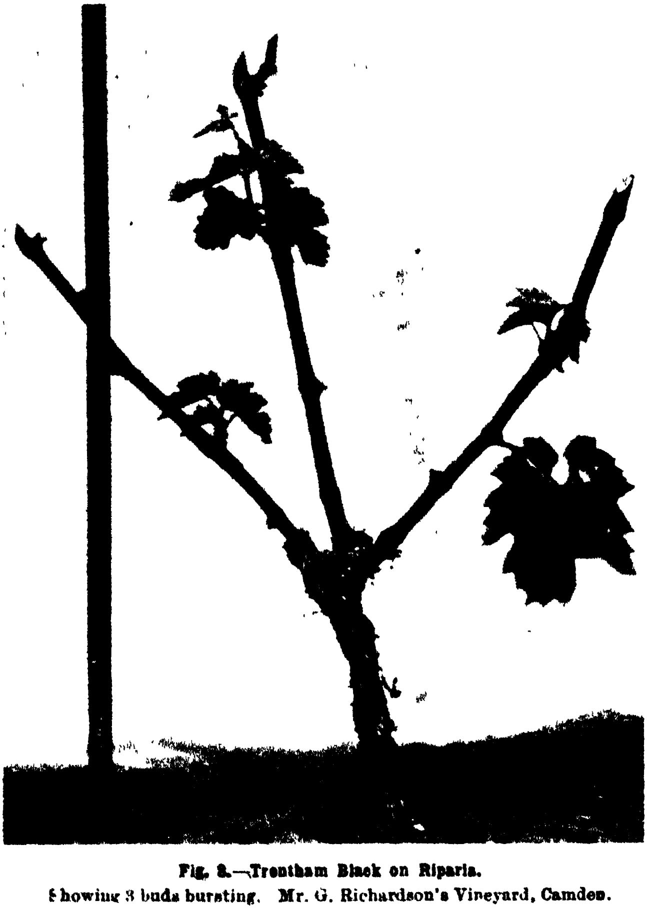


Fig. 2.—Trentham Black on Riparia.
Showing 3 buds bursting. Mr. G. Richardson's Vineyard, Camden.

of the bark cannot be detached clean; also it is likely that the bud will come off the shoot with a hole corresponding to the position of the side shoot, and if such a bud is used the operation is sure to fail. Sometimes even if the leafstem is too thick and ligneous, as is often the case with certain varieties, in detaching the bud with the section of bark attached, a clean round hole is seen near the bud, corresponding to the position of the leaf-stem. Such buds cannot be used and must be rejected. It is also necessary that the cavity under the bud corresponding to its core be clean and free from any woody tissue.

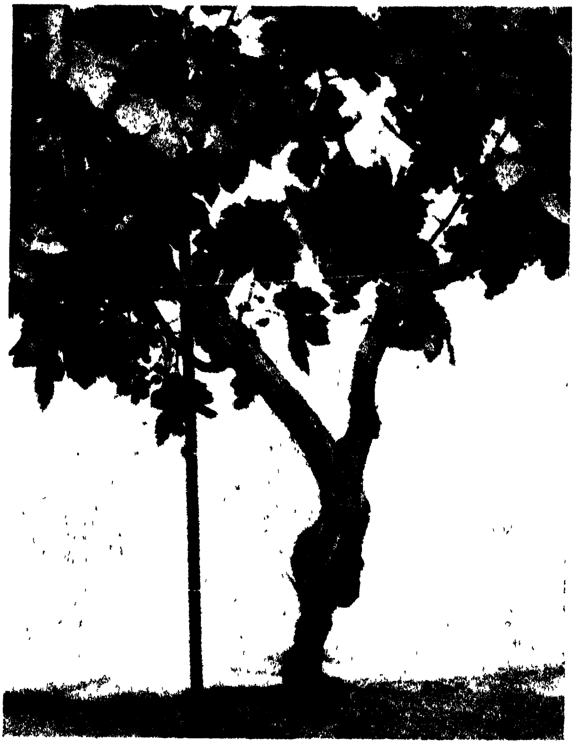


Fig. 9.—Showing a bad graft.
Chasselas de Jesus on Riparia Grand Glabre.

The shoots of the European vine which have to supply the buds are cut off the mother vine. All the leaves are cut off (see Fig. 1). The cutting off of the leaves helps the shoot to keep fresh by preventing the evaporation which otherwise would take place. The shoots are then put in a bucket with 5 or 6 inches of water; that will be sufficient to keep them fresh. Enough shoots are cut in the morning to last for the number of buds that can be made by noon. A fresh supply is got on resuming the work in the afternoon, to last till the end of the day's work.

When to Bud.

The actual budding can be started in the Albury and Corowa district during the first decade of November. In the County of Cumberland and in the Hunter River district a start may be made a little earlier. Of course, all depends on the season, as well as on the variety of vine that it is desired to propagate. It can be started when the shoots have attained such size that the bark can be easily removed. If too early the bark cannot be removed, because what the botanists call "differentiation of tissue" is not complete yet. The operation of budding can be carried on until the first decade of January in the Riverina, and till about Christmas in the County of Cumberland and in the Hunter River district.

Budding on European Stocks.

In the foregoing I described the operation of budding on a Phylloxera-resistant stock, and I hardly need to say that the system applies to any ordinary vine. Buds of a certain variety of European vine can be applied on another European sort, when the grower wishes to change the kind of grapes. So, if he be not satisfied, say, with Late Sherry, and he wants to change it into Black Hamburg, he may put a couple of buds or more of Black Hamburg on to the Late Sherry.

Budding Young Vines.

Young vines can be budded in the nursery bed—that is to say, on a young rootling. In this case it is not likely that any of the shoots will be strong enough the first year to allow the operation to be successfully performed, unless the young plants were purposely planted distant enough from one another for the shoots to attain a sufficient size. The practice, therefore, is to put the bud on the stem that is, on the wood which is already in its second year. In placing the bud it is desirable to put it on the small knob which marks the spot where the bud was on the cutting from which the plant was raised.

Advantages of Budding.

This system of budding has some special advantages over the ordinary split or whip and tongue graft.

Being done well above ground, there will be no top roots to cut off the scion.

The union is perfect, as there is no splitting of wood as in the two systems mentioned; thus many inconveniences peculiar to vines grafted by those methods are avoided, such as dwarfed and pinched shoots, dry rot round or inside the zone of the graft, chlorose or yellow disease, and the reddening of the leaves, which are all symptoms that the union between stock and scion is not perfect (see Fig. 8).

The shoot coming from a bud will bear grapes the following year, therefore there is a gain of one year's crop

It is a system of graft that will succeed in all soils, whereas the other systems will give a lower percentage of successful grafts in heavy and cold grounds.

After some practice a man can do from 110 to 120 a day. By the other systems a good man can do as many as 300 in a day, provided he be assisted by a lad, who removes the soil round the vines, cuts the stem off, puts clay or grafting wax round the graft, and earths up the soil round the graft in a mound, thus leaving to the man the splitting of the stock, the wedging of the scion, its insertion, and tying up the graft. If one man had to do everything, it is not likely that he would average more than 180 a day. In any case, budding is a slower process of vine-grafting, but the great advantages which it has, consequent on a perfect union being formed between stock and scion, justify the adoption of the system.

At any rate, a vine-grower may apply both systems in the reconstruction of his vineyard. He can utilise the end of winter and beginning of spring for the usual grafting, and when he can carry it on no longer, because of the vegetation being too far advanced, he can make ready for the budding. In a word, by bringing into use the system of budding, the time available for field-grafting is doubled, and that is certainly a great boon.

Furthermore, all those grafts that were done by the split or whip and tongue systems, and have failed, can be budded later in the season. On such grafts shoots will soon grow from the stem. Two of them are left and allowed to grow; all the others are rubbed off. On those left a bud or two are placed as soon as the shoots are strong enough.

Before closing the discussion, one last hint will be found useful. It is not necessary to take the buds of the European kind from a grape-bearing shoot. A non-bearing shoot, or even a side shoot, can supply the buds, which experience has shown to be as fruitful as the others.

RHODES GRASS *v.* PASPALUM.

MR. D. W. MONRO, "Hill Top," Little Nymboida, *via* Coramba, writes:—

In the *Gazette* for April, 1912, page 294, Mr. C. R. Staples, Woy Woy, says the Rhodes grass entirely disappears with the first frost. I have the same grass here, from an inch to 6 feet high, and up to the present (29th May) the frost has not affected it, though we have had some very heavy frosts of late. The cattle prefer it to Paspalum.

Mr Staples is correct in saying that Rhodes lies dormant in the winter. So does Paspalum. As they are both only summer grasses, you cannot expect them to grow in winter.

I would advise sowing the two grasses together, as where the Rhodes seed does not take, the Paspalum seed may. Rhodes does exceedingly well in this district.

Egg-laying Competitions at the Hawkesbury Agricultural College.

TEN YEARS' WORK.

D. S. THOMPSON, Poultry Expert.

TEN years' work was concluded on 1st April last in connection with the egg-laying competitions organised by the *Daily Telegraph*, and conducted at the Hawkesbury Agricultural College.

In several respects the results provide new data for the poultry world, the tests covering a variety of work that had never previously been attempted anywhere. That this was possible was due to the hearty co-operation of poultry-breeders, who entered into the purely experimental side of the work with some monetary loss to themselves.

The influence and usefulness of such tests as these cannot be confined to the breeders immediately concerned. The main object of the promoters was to stimulate systematic breeding for egg-production, and in this particular the results have amply justified the inauguration and continuance of the competitions. Where there was one poultry-keeper at the beginning of these tests who made egg-production a definite object by breeding from tested layers, there are now hundreds. The most satisfactory point is that the egg market remains as good as ever, and has been by no means fully exploited through the large increase. Sydney yet remains the best egg market in the world. It is certainly a pity that no general statistics of egg-production are possible in Australia under existing circumstances, and if the day ever comes for this production to be summarised, the figures will prove an eye-opener for Government and people alike.

The competitions have amply fulfilled the prophetic remarks of the chairman at the first committee meeting, when he said: "It is our desire to make the competitions a source of education to poultry-keepers.' That the committee and management have succeeded in this objective during the decade just closed may be evidenced from the marked improvements in poultry culture throughout the State, and wherever the influence of the competitions has permeated. During each succeeding year new experiments were made, and now pullets, second and third year hens, as well as first, second, and third year ducks, have been tested. Dry feeding *versus* wet feeding, as well as meat *versus* no meat, have also been tried, but still the problems to be solved remain almost as numerous as ever.

Each year the rules have been made much stricter as regards the types of the breeds represented, and each year there has been a corresponding improvement in the appearance of the pullets penned. In this way, the commercial poultry man has been encouraged to breed birds in which standard requirements and productiveness are combined, and thus the utility breeder has become a potent factor in modifying some of the ideals of the fancier, and bringing about more harmony in the type of the show bird and egg-producer.

The executive management was in the hands of a committee consisting of Messrs. H. W. Potts (Principal of the Hawkesbury College), D. S. Thompson, F. J. Brierley, S. Ellis, W. T. Ely, L. L. Ramsay, E. Waldron, and A. A. Dunnicliff, junior (*Daily Telegraph*).

THE PRIZE WINNERS.

Liberal cash prizes were given, amounting to £118, and including £50 donated by the *Daily Telegraph*. The following were the winners in the various sections: –

Third-year Hens.

Greatest number of eggs in the third twelve months:--J. Waugh (1), £3; Wharepaka Yards (2), £2: Griffiths Bros. (3), £1.

Monthly prize of 10s. for the highest total from a pen: -April: Range Farm and J. Waugh, 9 eggs, divided. May: Range Farm, 19 June: Griffiths Bros., 41 July: J. Waugh, 57 August: Range Farm, 120. September · Wharepaka Yards, 130. October: Wharepaka Yards, 130. November . J. Waugh, 120. December: J. Waugh, 115. January: J. Waugh, 120. February: J. Waugh, 116. March: J. Waugh, 93.

Second-year Hens.

Greatest number of eggs in second twelve months:--Hillcrest Farm (1), £3; F. Hopkins (2), £2: O'Hearn Bros. (3), £1 10s ; D. Morris (4), £1 ; C. C. Kennett (5), 10s.

Greatest number of eggs in the two years:—Hillcrest Farm (1), £3: F. Hopkins (2), £2; H. Hammill (3), £1.

Winter test (April to July, inclusive):—R. Jobling, 303 eggs (1), £2; A. C. Rule, 276 (2), £1; Hillcrest Farm, 258 (3), 10s

Market value of eggs for two years.—Hillcrest Farm (1), £2; F. Hopkins (2), £1 10s.; H. Hammill (3), £1.

Monthly prize for the highest total from a pen:—April: A C. Rule and R. Jobling, 58 eggs, divided. May: R. Jobling, 88. June: Forest Home Farm and Hillcrest Farm, 90, divided. July: H. Hammill, 107. August: F. Hopkins, 127. September: O'Hearn Bros., 135. October: G. H McKittrick, 139. November: S Champion, 119. December: O'Hearn Bros., 125. January: D. Morris, 127. February: F Hopkins, 103. March; G. R Nichols, 99.

Special prize of trophy, value £5, for the pen laying the most eggs in the two years without the replacement of a bird:--Hillcrest Farm.

Tenth Annual Competition.

Greatest number of eggs in the twelve months:—Cowan Bros. (1), £5; Range Farm (2), £4; R. Boardman (3), £3; N. Kaiser (4), £2; S Ellis (5), £1 10s.; S. C. Jones (6), £1; M. A. Vennard (7), £1: G. White (8), £1.

Winter test, first four months:—A. R. Kennedy, 463 eggs (1), £3; G. White, 415 (2), £2; Range Farm, 408 (3), £1 10s.; Miss A. Vaughan, 397 (4), £1.

Market value of eggs for the twelve months:--Cowan Bros. (1), £2 10s.; R. Boardman (2), £1 10s.; Range Farm (3), £1.

General utility prizes (open to pens the hens in which averaged at least 6 lb. each in weight on March 1, 1912), decided by the number of eggs laid:—A. Hollings, total weight of hens 39½ lb. (1), £1 10s.; Mrs. E. Scaysbrook, 36½ lb. (2), £1; J. Morgan, 38 lb. (3), 10s.

Monthly prize of 10s. for the highest total from a pen:—April: A. R. Kennedy, 96 eggs. May: A. R. Kennedy and S. C. Jones, 127, divided. June: R. Boardman, 130. July: Mrs. E. Scaysbrook, 146. August: Mrs. E. Scaysbrook and Cowan Bros., 146, divided. September: J. Morgan and Mrs. E. Scaysbrook, 145, divided October: Range Farm, 145. November: Range Farm, 141. December: C. Lloyd, 135. January: N. Kaiser, 133. February: Cowan Bros., 129. March: M. A. White, 126.

No-meat Feeding.

Greatest number of eggs in the twelve months :—M. A. Vennard (1), £2 10s. ; Cowan Bros. (2), £1 10s. ; T. Partridge (3), £1.

Third-year Ducks.

Greatest number of eggs in the third twelve months .—Trophy value £3 3s., G. E. O. Craft.

Second-year Ducks.

Greatest number of eggs in the second twelve months .—Mrs. B. Wakfer (1), £2 10s. ; G. Plowman (2), £1 10s. ; H. Short (3), £1.

Third Annual Duck Competition.

The greatest number of eggs in the twelve months .—J. P. de Beyer (1), £5 ; J. A. Friend (2), £3 ; D. Little (3), £2 ; G. Rogers (4), £1.

Market value of eggs for the twelve months .—J. P. de Beyer (1), £1 10s. ; D. Little (2), £1 ; G. Rogers (3), 10s.

Monthly prize of 10s. for highest total from a pen in the three duck sections. April : G. Rogers, 74 eggs. May : St. Joseph's Farm, 99 June : D. Little, 139. July : J. A. Friend and J. P de Beyer, 151, divided. August : J. P. de Beyer, 180. September : J. A. Friend, 161. October : G. Rogers, 158. November . S Ellis and G. Rogers, 156. December J. P. de Beyer, 144. January : J. A. Friend, 36. February : W. J. Poole, 50. March : J. A. Friend, 117.

GENERAL REVIEW.

The finish of the series of tests for 1911–1912 forms the first decade of any egg-laying competitions in the world, and the accumulated data should prove of immense value to the poultry keeping community. Right through the series, the general improvement in the type of the birds has been most marked, and the opening of the tenth annual test augured well for a further advance in the average production per hen. This improvement in type has been a leading feature in the competitions, and indicates great interest and unceasing study on the part of the breeders There is no doubt at the same time that the improvement of our methods of feeding and general attention has had much to do with the raising of the average from 131 to 184 eggs per hen.

NON-MEAT FEEDING.

The new feature introduced in the tenth series has thrown considerable light upon one of the questions that all poultrymen have to face, that of feeding laying hens with animal food in conjunction with their ordinary rations. For this purpose, ten pens of pullets were fed without animal food, and the results contrasted with the yield of ten pens of pullets of similar age, strain, and breed, entered by the same owners. These were fed with meat, in the form of boiled bullocks' livers and the soup therefrom at the rate of about 2 lb. of liver per week to each pen. Five pens each of heavy and light breeds were pitted against each other. The average results show that the addition of meat to the diet is of some advantage in inducing laying, but it only amounted to an increase of nine eggs per hen for the year and an additional value of 6d. per hen for the extra eggs produced. Meat supplies are usually more expensive than other foods, and the financial results must primarily govern any conclusions. In this test the hens fed with meat only gave an added profit of 3½d. each for the year, and the question is whether this pays for the extra labour involved.

In the autumn, contrary to general expectations, the no-meat-fed pullets laid well on a level with those receiving meat. It was our anticipation that meat supplies would prove most advantageous as the pullet-laying season advanced. This was borne out by results, the meat-fed pens showing up much better than their rivals during the spring and summer. The no-meat pens have, however, laid better than the others during the closing month, which is an important fact, as showing that stamina has been well maintained without the stimulation of animal food. It is evident that good, strong, well-matured pullets will lay well, meat or no meat. In the appearance and bodily condition of the birds in the two divisions no appreciable difference was to be noted at the close, and the partial moult commenced in both in a general way. It is noteworthy, however, that while there were no broodies amongst the White Leghorns that received no meat, there were five out of the thirty in the corresponding meat-fed pens.

WEATHER CONDITIONS.

The weather throughout the twelve months has been very suitable for egg-production, and, taking it all in all, it has proved a very good time for the poultryman who has had pullets sufficiently well forward, well housed, and well fed, to produce eggs in abundance during the early part of the season. Results clearly indicate that unless the poultryman secures his harvest in April, May, and June he cannot make a full financial success of his business. All through the autumn-winter test a very high profit was shown.

THE BROODY PROPENSITY

Broodies have been much less prevalent than during the earlier competitions, showing that greater egg-productive development lessens the tendency to broodiness. The propensity in this direction, however, has been showing up in a number of White Leghorns, and special rings have been used to indicate the offenders to their respective owners, to enable them to be discarded from the breeding pens. Of the total of 192 White Leghorns in the tenth competition twenty went broody during the year, fourteen pens out of the thirty-two being affected, while in one pen three of the six hens offended.

MANAGEMENT AND FEEDING.

The whole series has been carried out on essentially practical lines. The birds have received the simple, every-day treatment which any commercial poultryman can give. There has been no fancy feeding, no secret methods, but just the use of the plain wholesome diet that is available to any poultry-farmer. The system adopted at the outset of giving "full and plenty"—if anything, rather more than they eat—to laying hens, has been most successful, and most profitable for egg-production.

The hens have been fed on the simplest diet possible. The morning's meal consists of bran and pollard mash served at 7 a.m. In the earlier competitions somewhat more bran was used, namely, one of bran to two of pollard; but now one of bran to three of pollard is used, as it has been found that the latter is a more stiffening diet. On two mornings a week the mash is scalded with liver soup, and the minced liver and soup mixed with the bran and pollard. This is not only valuable for its protein content, but it has been found to act admirably as a tonic and appetiser, inducing the fowls to look for the mash with its meat seasoning with an increased zest. On the other mornings water only is used. In the afternoon grain is fed, wheat predominating, but maize is fed more frequently in the cold weather, and as a change from the wheat at other times, at the rate of one feed of maize per week in summer. Green food is given in the shape of rape and lucerne. The latter is of great feed value, while rape is the better alterative. Shell-grit is available in the hoppers at all times.

SECOND AND THIRD YEAR LAYING.

Results show that there is a margin of profit in carrying a number of hens into the third year, if they have proved good layers in their first and second years, especially if they are competently dealt with and wisely culled. Should they stop laying at any time, they should be promptly marketed on the eve of moulting in their third season. A good many of the hens in the test could have been marketed before the end of February, and the feed bill saved on some forty-five birds for five or six weeks. The laying of the third-year hens was much in advance of last year, the total of 1,013 eggs by J. Waugh's White Leghorns being a wonderful record.

This is the fifth of the series of second-year hen tests, and the conclusions drawn from the previous tests have been fully verified, viz., that while still profitable to keep, the profits are considerably reduced as compared with pullets. The mortality is no greater in the second year than in the first, and with abnormal heat in the height of summer, the old hens are no more affected with apoplexy than are the pullets.

THE FIRST-YEAR HENS.

The average laying of the pullets has again advanced. Last year we said that the average production could still be raised over 181 per bird, but it was more likely to come from the bottom pens than the higher ones. This has been shown to be the case, though there is still a great improvement possible among the lower pens. This is not expected so much from the individial pens as from the individual competitors. A good many of the birds sent forward were not matured. The owners state they are up to the age required by the rule, viz., seven months; but if they were so by the calendar, they are by no means so in maturity, and breeders can assist in maintaining a high average by sending matured pullets or none at all.

DUCKS AND PROFITS.

The ducks laid well, but not so freely as in the previous year, especially the second-year birds, which gave very little profit. The third-year ducks also little more than paid for their feed. The results do not compare favourably with those of the hens, chiefly owing to the lower prices obtained for duck eggs and the complete cessation of laying during the moult. The most noticeable feature with them, as compared with the hens, has been the absence of mortality during the twelve months. This year again meat meal has been used, but only sparingly, and with good results. The question of feeding any prepared meats largely has been rather a delicate one ; but we have used a good deal of the prepared article with none but good results, and we have no fear of any injury resulting from its more extensive use in the future.

HEALTH, MORTALITY, AND DISEASE.

The health of the birds has been extremely good, showing a lower mortality than the average of the ten tests. There were 5 deaths among the 60 third-year hens, 11 among the 180 second-year hens, and 20 among the 360 first-year hens, or a general average of 6 per cent. There were fewer cases of chicken-pox noticeable than ever before, while scaly leg has almost entirely disappeared. No other cases of infective or contagious disease have occurred, the whole of the deaths from disease being attributable to ovarian troubles.

Comparison of Results.

The following compares the results in the whole series :—

THIRD-YEAR HENS.

	Eggs per Hen.			Value per Hen.		
	First Year	Second Year	Third Year	First Year.	Second Year.	Third Year.
54 White Leghorns	209	148	134	25/6	13/3	11/11
6 Black Orpingtons	189	156	100	23/5½	15/2½	8/8
Average cost of feed per head	......	....	. .	6/9	5/8	5/11

SECOND-YEAR HENS.

	First	Second.	Third.	Fourth.	Fifth.
Number of pens	40	50	40	40	30
Highest total, two years	2,487	2,634	2,319	2,369	2,372
,, ,, second year	1,054	1,150	1,013	1,045	1,110
Average per hen, first year... ...	180	179	190	194	184
,, ,, second year .	124	127	140	134	140
Profit over feed per hen, first year	11/2	10/11	11/4	16/9	10/2
,, ,, ,, second year	6/0½	5/4¾	9/8	5/8	8/3
Greatest value of eggs, two years . .	12/1/6	12/16/9	13/2/5	12/14/2	12/2/2

	Eggs per Hen		Value per Hen.	
	First Year.	Second Year.	First Year.	Second Year.
102 White Leghorns	187	167	18/3	15/1
18 Langshans	176	136	17/2	13/7
6 Brown Leghorns	169	117	16/4	10/7
18 Silver Wyandottes	177	122	17/7	13/4
30 Black Orpingtons	159	104	15/1	9/7
6 White Orpingtons	128	112	12/5	11/4

TENTH ANNUAL COMPETITION.

	No of Pens	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Greatest Value.	Average Price of Eggs	Average Value per Hen.	Feed per Hen.	Profit over Feed.
1st ..	38	1,113	459	137	130	140/-	1/1	15/6	6/-	9/6
2nd ...	70	1,308	666	160	163	150/-	1/3¾	17/9	5/9¾	12/-
3rd .	100	1,224	532	154	152	114/-	1/-	12/9	4/5½	8/3
4th ..	100	1,411	635	168	166	125/-	/11½	13/3	5/3½	8/-
5th ...	100	1,481	721	162	171	137/-	1/0½	14/10	5/10	9/-
6th	60	1,474	665	161	173	149/-	1/2¼	17/2	7/-	10/2
7th ...	50	1,379	656	159	180	146/-	1/3¼	19/2	7/9½	11/4
8th ...	60	1,394	739	158	181	173/-	1/6½	21/9	6/9	15/-
9th ..	40	1,321	658	151	168	134/5	1/2	16/3½	6/1½	10/2
10th	50	1,389	687	146	184	141/9	1/2½	18/5½	6/1½	12/4

	Eggs per Hen.	Value per Hen.
6 Rose-comb White Leghorns	224	23/4½
192 S.C White Leghorns .	192	19/2
42 Black Orpingtons	187	18/11
18 Plymouth Rocks	162	16/5
30 Silver Wyandottes. ..	157	16/1
6 Minorcas . .	150	14/-
6 Cuckoo Leghorns	115	9/11
300 Hens.	184	18/5½

NO MEAT *v.* MEAT FEEDING TEST.

	No Meat	Meat Fed
Total eggs laid	11,112	11,665
Average per hen...	185·2	194·4
Market value per hen ..	18/10	19/4
Cost of feed per hen .	5/10	6/1½
Profit over feed, per hen .	13/-	13/2½

SECOND-YEAR DUCKS.

	First Year.	Second Year.
Number of pens.	5	6
Highest total	2,464	2,015
Highest second year	1,244	985
Average per duck, first year ..	185·3	185
Average second year	175·6	136
Profit over feed, per duck, first year.	10/7½	6/3
Profit second year	5/9½	-/11½

FIRST-YEAR DUCKS.

	First Competition.	Second Competition	Third Competition.
Number of pens	25	20	15
Winning total	1,235	1,278	1,245
Lowest total	507	835	714
Highest monthly total .	177	166	180
Average eggs per duck . ..	156·5	170·5	173
Greatest value	134/5	113/7	111/6
Average price of eggs	1/3	1/0½	1/1
Average value per duck ..	16/6	14/10½	15/7½
Cost of feed per duck	9/6	10/-	10/-
Profit over feed, per duck	7/-	4/10½	5/7½

THE FINANCIAL ASPECT.

The cost of feeding was based on the following contract prices for the staples:—Wheat, 4s. 6d.; maize, 3s. 9d.; and bran and pollard, 1s per bushel; livers, 4s per dozen; meat meal, 7s. 6d. per cwt; shell grit, 30s per ton; green feed, £2 per ton. The values of the eggs represent the prices realised in the Sydney market, less freight, commission, and charges. The total surplus over the cost of feed on the 100 pens of hens was £343 1s. 5d.; and on the twenty-five pens of ducks, £27 12s 9d.; grand total, £370 14s. 2d.

THIRD-YEAR HENS.

Cost of feeding: Wheat, £6 3s.; maize, £3 15s; bran and pollard, £5 5s.; meat, £1; shell grit, 10s.; green feed, £1 2s 6d.; total, £17 15s. 6d.

Market value of eggs laid, £34 16s 5d., leaving a profit of £17 0s. 11d.

SECOND-YEAR HENS.

Cost of feeding: Wheat, £18 7s. 6d.; maize, £12 15s.; bran and pollard, £15; meat, £3 2s. 6d.; shell grit, £1 5s.; green feed, £3; total, £53 10s.

Market value of eggs, £155 12s. 6d., leaving a profit of £102 2s 6d.

TENTH ANNUAL COMPETITION.

Cost of feed: Wheat, £31 10s.; maize, £21 5s; bran and pollard, £26 10s.; meat, £6 5s.; shell grit, £2 10s.; green feed, £4 10s; total, £92.

Market value of eggs laid, £276 18s. 7d., leaving a profit of £184 18s. 7d.

NO-MEAT TEST.

Cost of feeding: Wheat, £6 5s.; maize, £4 3s. 6d.; bran and pollard, £5 7s. 6d.; shell grit, 10s.; green feed, £1 5s.; total, £17 11s.

Market value of eggs laid, £56 10s. 5d., leaving a profit of £38 19s. 5d.

THIRD-YEAR DUCKS.

Cost of feeding: Bran and pollard, £10 5s.; meat meal, 14s.; shell grit, 15s.; green feed, 10s.; total, £12 4s.

Market value of eggs, £12 9s. 6d., leaving a profit of 5s 6d.

SECOND-YEAR DUCKS.

Cost of feeding: Bran and pollard, £15 10s.; meat meal, £1 1s; shell grit, £1 2s. 6d.; green feed, £1; total, £18 13s 6d.

Market value of eggs, £20 12s. 9d., leaving a profit of £1 19s. 3d.

FIRST-YEAR DUCKS.

Cost of feeding: Bran and pollard, £37 10s.; meat meal, £2 15s; shell grit, £3 5s.; green feed, £1 10s.; total, £45.

Market value of eggs, £70 8s., leaving a profit of £25 8s.

THE DETAILED RETURNS.

The following tables give full details of the number of eggs laid by each pen of six birds, together with the market value and the average weight of the eggs. The figures in parentheses after each competitor's name indicate the number of birds replaced owing to deaths over the whole period of the section. In the ninth annual competition, the hens that were fed on the dry-mash system are denoted by the asterisk (*) preceding the owners' name:—

THIRD-YEAR HENS.

Owner and Breed.	First Year.	Second Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Jan.	Feb.	March.	Third Year.	Grand Total.	Weight per doz.	Value Third Year.	Total Value.
																	oz		
1. J. Waugh (0), Bankstown: White Leghorns	1296	984	9	0	92	57	111	128	122	120	115	120	116	93	1013	3293	25	94/8	338/8
2. Wharepaka Yds. (2), Berowra: W. Leghorns	1214	873	0	0	10	44	115	130	130	116	113	87	56	88	859	2976	25	78/9	302 5
3. Griffiths Bros. (2), Balgowlah: White Leghorns	1263	865	0	10	41	28	107	113	94	99	99	113	73	54	831	2959	25	76 9	303/5
4. A. J. Wood (2), Quirindi: White Leghorns	1179	103·	0	1	9	55	93	114	115	105	87	82	80	69	820	3032	25	74/3	311/-
5. Range Farm (0), Toowoomba (Q.): W. Leghorns	1341	901	9	14	10	69	120	113	125	103	88	61	46	47	811	30 3	25	72/-	322 8
6. J. Jenson (3), Sefton Park: White Leghorns	1276	822	0	16	29	18	81	119	116	92	103	85	70	65	797	2895	25	73/3	299/3
7. P. Lowe (1), Lower Portland: White Leghorns	1324	1045	7	2	0	43	111	119	126	98	76	104	52	38	786	3155	26	68/3	322/5
8. A. W. Hodson (1), Enfield: White Leghorns	1078	673	0	2	26	27	102	118	122	93	97	72	51	20	730	2481	26	62/9	254/6
9. M. Foran (0), Concord: Black Orpingtons	1130	938	6	2	6	22	76	118	88	71	94	40	44	23	6 0	2668	25	52/-	284 -
10. M. A. Vennard (1), Eastwood: White Leghorns	1306	788	0	2	0	50	94	83	94	75	60	54	25	6	533	2627	25	44/-	272 9
Total	12407	8922	31	54	173	433	1003	1155	1133	972	932	818	613	493	7810	29139	..	696/8	3011.1
Average per hen	206 8	148 7	·5	9	2·9	7 2	16 7	19·3	18 9	16 2	15 5	13 6	10·2	8·2	130·1	485·6	.	11/7	50/2

SECOND-YEAR HENS.

Owner and Breed.	First Year	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Second Year.	Grand Total.	Weight per doz.	Market Value.
																oz.	
1. Hillcrest Farm (0), Berowra : White Leghorns	1262	12	55	90	101	114	124	113	101	101	117	98	84	1110	2372	25	242/2
2. F. Hopkins (0), Byron Bay : White Leghorns	1212	27	73	67	81	127	131	116	108	63	106	103	90	1092	2304	25	230/9
3. H. Hammill (0), Kogarah : White Leghorns	1321	13	39	85	107	115	118	108	78	91	82	61	53	950	2271	25	227/5
4. C. C. Kennett (1), Glenfield : White Leghorns	1128	48	36	52	79	120	128	117	107	99	97	70	53	1006	2134	25	213/9
5. F. J. Brierley, (1), Cheltenham : White Leghorns	1268	3	48	62	84	111	104	98	86	94	76	48	31	845	2113	26	209/6
6. O'Hearn Bros., West Maitland : White Leghorns	1023	0	19	69	88	116	134	137	115	125	100	101	85	1089	2112	26	194/7
7. E. Greentree (0), Wyong : White Leghorns	1111	9	12	44	91	120	119	129	90	89	108	97	62	970	2091	26½	197/4
8. D. Morris (0), Kellyville : White Leghorns	1041	13	19	68	77	109	129	104	114	101	127	94	64	1019	2060	26	198/6
9. J. J. McKenna, jun., (1), Kenthurst. White Leghorns	1171	13	29	30	42	112	119	105	105	91	87	80	70	883	2054	25½	193/9
10. R. Jobling (0), Wallsend : Silver Wyandottes	1090	58	85	69	88	110	101	91	75	53	68	98	66	962	2052	25	212/8
11. W. T. Ely (0), Rydalmere : White Leghorns	1192	2	10	74	70	98	96	107	84	84	82	76	43	831	2023	26	203/9
12. H. G. McKittrick (1), South Grafton : White Leghorns	1067	0	14	21	73	121	126	139	105	107	106	81	38	931	1998	26	182/8
13. G. R. Nichols (0), Llandilo : White Leghorns	1022	29	0	37	79	105	120	110	89	101	96	99	99	964	1986	26½	186/7
14. S. Champion (0), Eskbank : White Leghorns	1033	13	19	9	25	99	119	125	119	118	118	98	58	920	1953	25	183/3
15. C. R. G. Macdonald (1), Ingleburn : White Leghorns	1085	1	41	53	50	116	126	84	90	88	89	67	52	857	1942	25	189/-
16. Mrs. J. W. Cox (1), Marrickville : Langshans	954	38	41	59	85	105	117	110	99	95	75	84	75	983	1937	26	194/2
17. D. Quinlan (1), Spring Hill : White Leghorns	974	11	32	45	78	104	95	123	108	96	112	95	60	959	1933	26½	181/6
18. R. J. Stuart (0), Blacktown : White Leghorns	1052	4	18	31	72	112	126	117	98	86	85	81	39	869	1921	26	180/9
19. E. Boxsell (1), Tilba Tilba : White Leghorns	1109	2	12	64	35	90	104	88	87	86	108	78	53	807	1916	25½	187/8
20. A. S. Rule (0), Croydon : Silver Wyandottes	1071	58	75	89	54	58	81	85	30	53	71	78	79	811	1882	26½	196/6
21. Forest Home Farm (1), Adamstown : Langshans	1027	20	73	90	65	104	105	80	65	80	43	57	41	823	1850	25	190/5
22. W. Smith (3), Rydalmere : Black Orpingtons	1030	4	7	16	99	106	106	104	71	65	90	70	61	799	1829	26	166/-
23. J. Gamble (0), Ashfield : Langshans	1086	6	13	46	46	94	82	53	55	66	58	77	51	647	1733	25	169/3
24 Bright and Thompson (0), Dulwich Hill : Brown Leghorns	1014	0	7	10	28	65	100	101	84	99	91	78	42	705	1719	25	161/9
25. D. Kenway (5), Pennant Hills : Black Orpingtons	1119	39	10	29	67	66	81	70	61	53	34	49	42	591	1710	25	177/9
26. E. Waldron (0), Willoughby : Black Orpingtons	950	9	0	0	8	77	87	104	92	69	79	85	75	685	1635	26	149/2
27. Mrs. E. L. Scott (1), Willoughby : White Orpingtons	765	18	44	66	88	90	84	67	53	52	37	30	47	676	1441	26	142/6
28. G. Hopping (1), Ingleburn : Silver Wyandottes	1018	40	31	41	44	59	47	25	13	13	38	17	54	422	1440	25	148/3
29. Roach and Trickett (1), Wollongong : Black Orpingtons	889	29	3	13	22	48	87	78	68	58	42	38	21	507	1396	28	128/1
30. L. L. Ramsay (0), Carlingford : Black Orpingtons	774	0	1	47	31	60	81	84	65	47	43	46	58	563	1337	25½	121/-
Total	31858	519	869	1466	1957	2930	3178	2972	2512	2423	2465	2234	1751	25276	57134	..	5560/8
Average per hen respectively	177	2.0	4.8	8.1	10.9	16.3	17.7	16.5	14.0	13.5	13.7	12.4	9.7	140.4	317.4	..	30/11

FIRST-YEAR HENS.

Owner and Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
1. Cowan Bros. (0), Burwood : White Leghorns	47	111	103	132	146	144	136	135	123	122	129	61	1389	24½	141/9
2. Range Farm (0), Toowoomba (Q.) : White Leghorns	80	111	110	107	144	143	145	141	105	116	93	61	1356	24	139/8
3. R. Boardman (0), Camden : R.C. White Leghorns	43	89	130	106	124	141	130	102	125	114	127	114	1345	24	140/2
4. N. Kaiser (0), Sackville : White Leghorns	55	70	128	111	100	133	132	128	134	133	116	90	1330	25½	137/9
5. S. Ellis (1), Botany : White Leghorns	80	103	86	117	143	142	140	98	99	99	106	79	1292	25	134/1
6. S. C. Jones (0), Wentworthville : White Leghorns	21	127	124	110	123	130	124	118	128	115	88	78	1286	24½	133/2
* M. A. Vennard (0), Eastwood : White Leghorns	25	95	106	125	116	128	122	108	109	118	108	112	1272	24	131/-
7. G. White (1), Willoughby , White Leghorns	60	117	134	104	144	143	115	104	98	119	94	33	1265	25	132/-
8 T. Partridge (1), Westmead : White Leghorns	57	111	124	96	139	120	131	99	122	107	87	69	1262	25½	131/9
9. W. E. Boutcher (0), Canterbury : White Leghorns	21	32	99	102	139	132	133	125	112	127	107	96	1225	24	120/6
10. A Duffield (0), Carlingford : White Leghorns	0	56	118	109	140	127	135	121	128	108	104	71	1217	25	119/3
11. Miss A. Vaughan (0), Riley's Hill : White Leghorns	51	128	119	99	134	138	142	117	111	96	76	5	1216	24	123/9
* Cowan Bros. (0), Burwood : White Leghorns	49	116	97	84	124	129	120	93	108	113	92	79	1204	24½	125/6
12. M. A. Vennard (2), Eastwood : White Leghorns	5	90	124	125	132	130	125	120	91	72	81	106	1201	24	121/9
13. A. Hollings (0), Rookwood : Black Orpingtons	80	94	99	85	142	126	117	84	89	105	82	93	1196	24	126/2
14. Mrs. J. Fitzgibbon (0), Marrickville : White Leghorns	21	81	51	95	145	132	127	104	124	125	92	99	1196	25	118/5
15. M. A. White (1), Sackville : White Leghorns	13	51	99	68	119	124	127	107	124	119	113	126	1190	25	130/1
16. W. J. Poole (1), North Ryde : Black Orpingtons	69	74	126	133	140	146	135	98	101	74	49	40	1185	23	119/2
17. Mrs. E. Scaysbrook (1), East Gosford : Black Orpingtons	0	16	71	146	146	145	114	109	106	106	103	116	1178	24	113/7
18. Turner Bros. (0), Ingleburn : White Leghorns	57	73	62	101	126	134	127	111	124	89	96	76	1176	26½	118/4
19. Mrs. E. J. Hunt (0), Berowra : White Leghorns	40	76	67	67	132	127	122	122	130	122	97	71	1173	24	117/-
20. Miss L. Griffin (0), Kenthurst : White Leghorns	56	108	83	104	142	127	119	98	103	108	83	36	1167	24	119/3
21. T. Brophy (0), Upper Manilla: White Leghorns	61	79	102	78	140	141	119	107	126	105	73	36	1167	26	117/8
* T. Partridge (0), Westmead : White Leghorns	86	91	112	96	120	137	121	80	87	83	91	62	1166	24	123/-
22. Griffiths Bros. (0), Balgowlah : White Leghorns	15	29	111	123	125	122	127	120	125	92	107	61	1157	24	113/4
23. Johns Bros. (1), Wyong: White Leghorns	13	53	89	119	116	133	134	119	102	109	102	62	1151	24½	112/9
24. R B. Hay (0), Blacktown : White Leghorns	6	79	75	99	104	127	133	112	115	115	86	97	1150	25	112/8
* Mrs. E. J. Hunt (0), Berowra : White Leghorns	44	49	108	79	116	126	119	98	109	118	108	75	1149	24½	116/3
25. H. J. Hollier (0), Emu Plains : Black Orpingtons	10	115	122	114	123	118	109	89	88	91	87	83	1149	24	119/-
26. C. Leach (0), Belmore : Plymouth Rocks	45	109	109	128	120	95	103	86	82	94	83	85	1139	25½	121/3
27. J. Morgan (1), Port Kembla : Black Orpingtons	69	44	71	100	130	145	136	114	99	104	51	74	1137	25	111/-
* W. H. Forsyth (0), Willoughby : Silver Wyandottes	28	56	101	138	147	136	104	79	97	79	89	77	1131	25	113/5
* W. J. Poole (2), North Ryde, Black Orpingtons	49	87	90	125	125	123	119	80	105	73	71	83	1130	25½	116/1
* A. R. Kennedy (1), Carlingford . Black Orpingtons	96	127	126	114	117	109	73	83	57	68	68	91	1129	26½	125/5
28. W. H. Forsyth (0), Willoughby : Silver Wyandottes	23	66	69	137	139	139	108	91	86	80	88	87	1113	25	111/-
29. Weaver and Graham (1), Lindfield · White Leghorns	13	67	90	53	106	138	125	124	122	109	89	75	1111	25	109/7
30. T. T. Casey (0), Maclean : White Leghorns	7	71	64	92	137	134	133	102	102	105	80	56	1083	24½	104/2
31. F. O. McKittrick (0), South Grafton . Silver Wyandottes	9	60	110	99	113	123	107	106	94	78	92	89	1080	23	109/-
32. C. Lloyd (0), Meadow Bank . White Leghorns	26	50	44	96	118	128	114	128	135	114	76	51	1080	24½	103/9
33. L. H. Stewart (0), Berowra Plymouth Rocks	28	72	127	95	120	125	95	93	84	80	67	84	1070	23½	110/7
* C. Lloyd (0), Meadow Bank · White Leghorns	51	70	36	70	123	126	123	104	107	125	90	44	1069	25	105/3
34. C. W. Brown (0), Jilliby Jilliby · Black Orpingtons	22	66	124	80	138	94	105	97	101	77	75	87	1066	26	109/2

First-year Hens—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	Sept	October.	Nov.	Dec.	January.	Feb.	March.	Total	Weight per doz.	Market Value.
														oz.	
35. D. Houison (0), Ingleburn: White Leghorns	17	77	80	68	133	119	114	112	120	101	69	56	1066	25	104/1
36. W. J. Ransley (0), Llandilo: White Leghorns	39	5	104	81	121	124	110	98	105	106	70	79	1042	26	102/9
37. Morrison Bros. (0), Ryde: White Leghorns	4	38	74	78	135	132	128	110	103	120	75	44	1041	26	98/4
38. J. W. Tipper (1), Belmore: White Leghorns	29	85	83	53	118	125	118	81	104	76	82	78	1032	25	105/2
39. C. Bloomfield (0), Willoughby: White Leghorns	59	82	78	59	120	118	88	95	80	102	78	71	1030	24½	107/2
40. A. J. Wood (0), Quirindi: White Leghorns	29	28	61	89	129	125	134	100	127	94	60	49	1025	25	97/1
41. G. P. H. Dixon (0), Mittagong: White Leghorns	31	53	61	86	132	137	132	86	114	92	62	34	1020	25	97/9
42. L. K. Pettit (0), Albury: White Leghorns	9	2	21	77	127	136	135	116	108	90	99	96	1016	24	93/7
43. A. O. Weynton (0), Lindfield. Silver Wyandottes	29	43	102	115	127	102	76	86	67	86	93	52	978	24	99/9
* C. Leach (1), Belmore: Plymouth Rocks	61	75	78	91	120	99	93	75	83	73	46	79	973	25	100/9
44. A. R. Kennedy (1), Carlingford. Black Orpingtons	3	84	114	73	120	114	118	55	87	60	74	42	944	25½	95/5
45. Wilson and Coombes (1), Lithgow. Minorcas	0	8	70	89	118	110	114	94	73	99	74	47	896	28	84/-
* A. O. Weynton (1), Lindfield Silver Wyandottes	50	59	62	88	100	61	89	67	82	67	76	90	891	25	73/9
46. J. C. Gould (2), New Lambton Silver Wyandottes	24	61	67	58	80	110	91	56	66	66	75	47	801	24½	81/6
47. T. Lawrence (0), Cowra: Silver Wyandottes	8	38	46	49	127	97	96	53	67	67	47	52	747	24	81/3
48. C. Gooch (1), Enfield: White Leghorns	0	25	37	54	91	116	85	81	78	82	53	16	718	25	65/5
49. W. H. Harris (0), Cheltenham: Plymouth Rocks	0	0	31	85	115	119	95	70	78	36	59	26	714	23½	63/4
50. F. Greenwell (1), Mittagong. Cuckoo Leghorns	0	0	0	10	117	132	93	68	86	64	67	50	637	25	59/6

As this table includes meat fed and no-meat hens, the totals and averages are not detailed as in other cases.

Third-year Ducks.

Owner and Breed.	First Year	Second Year	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Third Year	Grand Total	Weight per doz.	Value Third Year.	Total Value.
																	oz.		
1. G. E. O. Craft (2), Ingleburn: Indian Runners	1034	1019	66	45	24	40	117	113	129	138	99	22	1	32	826	2879	34	68/1	264/9
2. G. Rogers (1), North Ryde: Indian Runners	1220	1244	74	57	22	87	125	73	100	76	56	10	10	29	719	3183	32	64/9	303/9
3. Hughes Bros. (0), Teralba: Buff Orpingtons	1105	882	38	18	45	95	142	83	104	109	69	2	0	0	703	2690	32	58/7	253/9
4. D. Salter (1), Wilberforce: Indian Runners	1092	1075	65	44	38	91	103	64	79	72	68	9	5	6	644	2811	33	58/1	275/1
Total	4451	4220	243	164	129	313	487	333	412	395	292	43	16	67	2892	11565	..	249/6	1097/4
Average per duck	185·5	176·0	10	6·8	5·4	13	20·3	14	17·2	16·5	12·2	1·7	·7	2·8	120·5	479·6	..	10/6	45/9

SECOND-YEAR DUCKS.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Second Year.	Grand Total.	Weight per doz.	Total Value.
																oz.	
1. Mrs. B. Wakfer (0), Chatswood : Cantonese	1030	17	2	69	147	151	142	128	131	90	15	30	63	985	2015	28	169/6
2. H. Short (1), Ryde : Indian Runners	1158	55	63	42	106	95	93	110	110	87	11	15	20	807	1965	32	176/1
3. G. Plowman (0), North Bondi : Indian Runners	1122	30	70	89	61	102	112	125	128	87	13	0	13	830	1952	30	173/9
4. G. E. O. Craft (0), Ingleburn : Indian Runners	1120	13	51	45	49	118	105	103	125	115	17	1	22	764	1884	30	167/-
5. G. Howard (1), Marrickville : Indian Runners	1136	44	74	21	19	93	114	140	142	83	8	0	3	741	1877	31	165/-
6. Bright and Thompson (0), Dulwich Hill : Indian Runners	1090	24	19	69	75	119	124	101	111	90	2	15	22	771	1861	23	158/4
Total	6656	183	279	335	457	678	690	707	747	552	66	61	143	4898	11554	..	1009/8
Average per duck	185	5·1	7·7	9·3	12·7	18·8	19·2	19·6	20·7	15·3	1·8	1·7	3·0	136	321	..	28/1

FIRST-YEAR DUCKS.

Owner and Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
1. J. P. de Beyer (0), Charlestown : Indian Runners	14	95	122	151	180	122	146	144	144	25	15	87	1245	31½	111/6
2. J. A. Friend (0), Willoughby : Indian Runners	7	62	71	151	161	161	149	140	126	36	29	117	1210	28	106/6
3. D. Little (0), North Ryde : Indian Runners	30	90	139	144	155	111	115	132	112	28	24	96	1176	27½	110/9
4. G. Rogers (0), North Ryde : Indian Runners	10	90	128	146	169	102	158	156	115	21	22	41	1158	29	103/5
5. C. Kenny (0), Ryde : Indian Runners	60	93	122	165	150	117	127	135	132	34	21	70	1120	29	107/8
6. W. J. Poole (0), North Ryde : Indian Runners	9	97	46	144	157	139	133	128	107	24	50	65	1090	27½	96/8
7. St. Joseph's Farm (0), Ryde : Indian Runners	22	99	113	149	161	98	137	152	77	0	0	67	1075	30	98/3
8. G. E. O. Craft (0), Ingleburn : White Runners	63	84	108	135	155	77	101	142	97	22	37	53	1074	29	100/6
9. S. Ellis (0), Botany : Indian Runners	0	64	77	145	156	117	152	156	121	7	0	54	1049	29	89/7
10. A. J. Wood (0), Quirindi : Indian Runners	0	49	86	147	158	110	142	138	129	26	24	30	1039	30	89/-
11. Morrison Bros. (0), Ryde : Indian Runners	7	39	95	130	155	109	122	143	85	0	3	70	958	30	83/8
12. L. Ducat (0), Bankstown : Indian Runners	9	44	75	133	137	122	116	105	98	16	9	89	953	29	85/4
13. F. W. Rose (0), Bankstown : Indian Runners	29	52	98	125	159	88	120	96	114	33	7	26	947	26½	84/1
14. L. E. Hewitt (0), Broke : Indian Runners	20	71	87	140	156	54	64	110	83	17	21	69	892	28	85/5
15. J. Ahern (0), Tempe : Buff Orpingtons	0	14	25	113	138	102	124	132	57	0	0	9	714	28	55/7
Total	280	1043	1392	2118	2347	1520	1906	2009	1597	289	262	943	15706	..	1407/11
Average per duck	3·1	11·6	15·5	23·5	26	17	21·2	22·3	17·7	3·2	2·9	10·5	174·5	..	1/7½

Agricultural Bureau of New South Wales.

(Notes Compiled by E. Harris.)

Branch.	Honorary Secretary.
Bathurst	Mr. J. McIntyre, Orton Park.
Bonville	Mr. H. B. Faviell, Bonville.
Cardiff	Mr. D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coreen-Burraja	Mr. H. Vickers, Coreen.
Cowra	Mr. M. H. Reynolds, Experiment Farm, Cowra.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. T. Glasgow, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *via* Inverell.
Lower Lawrence	Mr. E. T. Cooney, Lawrence.
Mangrove Mountain	Mr. G. T. Hunt, Mangrove Mountain
Milbrulong	Mr. O. Ludwig, Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *via* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, Penrose.
St. Mary's	Mr. W. Morris, Queen and Victoria sts., St. Mary's
Sackville	Mr. C. H. Britten, Sackville.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a précis of any paper which may have been read and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Lectures and Demonstrations.

A number of lectures on veterinary subjects to be given by the Veterinary Surgeons of the Department, and demonstrations on pruning and grafting, with information on winter spraying, by Mr. J. G. R. Bryant, Assistant Fruit Expert, have been arranged as follows :—

Veterinary Lectures:

Peak Hill, 10th July.
Bathurst, 18th „
Spring Hill, 25th July.
Cowra, 7th August.
Inverell, 9th „

Orchard Demonstrations:

Katoomba, 2nd July.
Walla Walla, 9th July.
Penrose, 19th „
Gunning, 24th „
Yass, 25th July.
Parkes, 13th August.
Mangrove Mountain, 21st August.
Wallendbeen, 26th August.

Cundletown.

A Veterinary Officer will deliver a lecture in the Cundletown School of Arts on Monday, 15th July, at 8 p.m.

Forest Creek.

The branch has obtained offers from local farmers of sites for experiment plots, and the Inspector has selected one submitted by Mr. J. G. Chudleigh. This plot will be prepared for sowing next season.

Grenfell.

The annual subscription for this branch has been fixed at 2s. 6d.

On the 11th June, in the Masonic Hall, Mr. Veterinary Surgeon Palgrave lectured on "Conformation and Unsoundness in Horses."

Gunning.

Two demonstrations have been fixed for the month of July. On the 18th the Sheep and Wool Expert will visit and advise the members on sheep and wool matters, giving a lantern lecture at night, and on the 24th the Assistant Fruit Expert will show the best methods of pruning and grafting.

At the June meeting the subject for discussion was "Should the Dipping of Sheep be made Compulsory," and a unanimous decision was arrived at in the affirmative.

Katoomba.

Mr. Bryant, the Assistant Fruit Expert, will give a demonstration on "Pruning and Grafting" on the 2nd July.

At the last meeting the business included the receipt of correspondence from the local Member of Parliament in regard to the completion of the Megalong road to the Valley, and a market quotation from J. H. Lütten and Son, of Hamburg, Germany, for Australian apples, soliciting consignments. The Honorary Secretary read an extract from the proceedings of the Farmers' Institute, British Columbia, on "Apple Packing for Export."

Leech's Gully.

The following office-bearers have been elected :—Chairman, Mr. G. R. Smith ; Vice-Chairman, Mr. A. Mansfield ; Honorary Treasurer, Mr. A. Weir ; and Honorary Secretary, Mr. J. Weir. An executive committee to work in connection with the office-bearers was also elected. Nineteen members have joined, and the subscription has been fixed at 2s. per annum.

Little Plain.

At the monthly meeting held on the 25th April, a paper was read by Mr. W. Tonkin, on the "Farmers' Wheat Experiment Plots for the District."

The branch has made a request that the milling results of wheats exhibited at the recent Royal Agricultural Show in Sydney be published in the *Agricultural Gazette.* This matter is already in hand, and the Chemist, Mr. F. B. Guthrie, is preparing an article for publication.

Mangrove Mountain.

The formation of a branch at this place has been completed, the following officers having been elected:—Chairman, Mr. C. T. Tange; Vice-Chairman, Mr. W. H. Kelynack; Honorary Secretary and Treasurer, Mr. G. T. Hunt. The annual subscription is 2s. 6d. The branch starts with a membership of twenty-one.

The Assistant Fruit Expert, Mr. J. G. R. Bryant, will give a pruning demonstration on the 29th August.

Milbrulong.

The Sheep and Wool Expert will make his concluding visit to the branch on the 1st August, and will give practical instruction amongst the sheep during the day, to be followed in the evening by a lecture illustrating the results of experiments, when the different crosses will be shown on a series of lantern slides.

Orchard Hills.

A pruning demonstration was given by Mr. J. G. R. Bryant, the Assistant Fruit Expert, on the 20th June; and arrangements are being completed for a lecture by Mr. Bradshaw on "Egg Production and General Management of Poultry," at the Orchard Hills Public School, on 1st July.

Parkes.

On the 13th June, Mr. Veterinary Surgeon Sanderson gave a lecture on "The Treatment of Wounds and Colic.' The 13th August has been fixed for a pruning demonstration by the Assistant Fruit Expert, Mr. J. G. R. Bryant, and this will take place in the orchard in Wellington-road known as "Cherry Gardens."

Penrose.

A practical demonstration in Pruning and Grafting will be given by the Assistant Fruit Expert, in Messrs. Seniors' "Westwood" Orchard, on the 19th July.

St. Mary's

A pruning demonstration was given by the Assistant Fruit Expert, Mr. J. G. R. Bryant, on the 19th June.

Sackville.

At the meeting on the 31st May, Mr. J. Aspery, Chairman of the branch, read a paper on "Maize Culture." Mr. Dairy Instructor Pedersen delivered a lecture on dairying in the local School of Arts on the 21st June, whilst on the 12th, Mr. J. G. R. Bryant, the Assistant Fruit Expert, gave a practical demonstration on Pruning and Grafting and information *re* Winter Spraying.

Tallawang.

There has been a loss of several valuable horses in the district owing to their having been turned on green maize stalks to feed; and the Stock Branch advised the proper treatment in such cases, which will be published next issue.

This branch held its fifth meeting during the current year on the 25th May, when there was a full attendance of members. The Honorary Secretary (Mr. J. E. Hansell) read papers dealing with "Colic in Horses," "The Treatment for Worms in Horses," and "Green Maize as a Fodder for Large Stock."

Walli.

This branch is to be congratulated upon taking the progressive educational step of securing a magic lantern for use at lectures. The Honorary Secretary has applied to the Department for slides of suitable subjects, but it is considered that slides without appropriate and full information would be of little or no use, and further they might very likely mislead. If any special pictures are required by a lecturer competent to explain them, the Department will lend them to the branches, and the Departmental lecturers will also take slides with them when lecturing before branches that possess lanterns.

Yass.

Mr. Cyril Ferris has been elected to the position of Honorary Secretary, in place of Mr. S. Mann, who has removed from the district.

The Assistant Fruit Expert will give a demonstration on Pruning and Grafting on the 25th July, at the orchard of Mr. R. Colvin.

Orchard Notes.

W. J. ALLEN.

JULY.

Bitter Pit.

THERE are several experiments which may be tried for controlling this trouble, among which are liming; watering a few trees in order to keep up a good supply of moisture; drainage; spraying trees with lime and sulphur solution about the time they are breaking into blossom; and in pruning, keep them well opened out so that all the fruit has plenty of light and sunshine. A too dense growth or too much shade should not be encouraged after the tree has commenced to bear.

Wherever varieties are found to be affected from year to year, no time should be lost in either grafting or budding such to the best export varieties which are supposed to be fairly free from the trouble.

Grafting and Budding.

Grafting may be done in the spring, just when the buds begin to swell; or budding in the fall, while the bark raises readily. If it is desired to bud in the spring, scions with well developed buds may be cut this month from picked trees which have borne good fruit. Place these in cold storage, where they may be kept until the young trees are ready to bud in the spring, when they may be inserted. As soon as it is discernible which have taken, the branch may be cut back, when it will be found that these buds will soon make a growth, and will then need to be tied to a stake in order to prevent their being blown off.

In budding, it is well to put in plenty of buds, so that if a few do not take there will be enough left from which to start the new top. The bud should always be inserted about where it is desired to have a branch. This will ensure a well formed tree, which should carry some fruit the second year. All cuttings for grafting should be heeled in the ground in a cool, damp place.

Planting.

Where orchards are to be planted, the land should be in readiness to plant citrus fruits, as well as apples, pears, &c. The latter trees should be put in this month, while the citrus trees may be planted either at the end of August or early in September. In cold late districts only plant varieties of apples and pears suitable for export.

Refills.

All refills other than citrus fruits should be planted with as little delay as possible now.

Pruning.

The most important work during this month is the pruning, which must be pushed on as fast as possible now, so that it will be completed and the ground well ploughed while it is still moist. Each and every tree has its own individuality, and, therefore, the grower should study the habits of the different trees, and prune them in such ways as will ensure that they will return him the best fruit from year to year. Both old and young trees are full of fruiting spurs and buds this season, and, therefore, the grower will be justified in removing more wood than usual this pruning, in order to prevent his trees from overloading. Weak trees may have their leaders well shortened back. Burn all prunings as soon as possible. The most expeditious way to accomplish this is to mount an old tank on wheels with grating in bottom.

While pruning or working around the trees, always keep a sharp lookout for any diseases which are liable to attack them, and mark any tree so affected.

Apply stable manures this month.

Citrus fruit handling, packing, and marketing are continued this month.

Scrape and burn loose bark from apple, pear, and quince trees.

Orchards should be kept in thorough order from the 1st August until 1st April each year.

Fumigating Citrus Trees.

Mr. R. E. Peck, of Kurrajong, states that he prefers winter fumigation. He then uses No. 2 Table with, he claims, the very best results. He says he can proceed with the work in the daytime, and can then operate more easily than at night, and with no more likelihood of damaging the trees.

I have to acknowledge receipt of some very fine specimens of Navel oranges from Mr. S. Black, Lisarow.

"A VISIT TO IANDRA."

IN the article on this subject by Messrs. Ditzell and Pridham in June *Gazette*, it is stated on page 489 that the "Giant" strippers take off 16 acres a day and even more. The context may lead readers to think that this is the capacity of a pair of such strippers. This is not so. *Each* stripper takes off 16 acres per day.

Department of Agriculture,
Sydney, 2*nd July,* 1912.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORNS.—Roan Pansy: sire, Royal Hampton 10th (imp.); dam, Forest Pansy; calved 3rd December, 1910; colour, roan. Price, **25 guineas.**

Forest Pansy is by Oxford's Forest King (imp.) from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.). This strain has proved a good dairying one for several generations of cows. Forest Pansy yielded 5,785 lb. milk in forty-one weeks, equal to 272 lb. butter.

***Duke of Hampton:** sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

***Pilgrim's Progress:** sire, Pansy's Progress; dam, Dora Hampton; calved 10th June, 1911; colour, red and a little white. Price, **£20.**

Pansy's Progress is by Dora's Boy from Pansy 4th (imp.). Dora's Boy is by Cornishman (imp.) from Lady Dora (imp.). Dora Hampton, in thirty six weeks, on her first calf, gave 2,649 lb. of milk, testing 4 per cent. butter-fat. This heifer is by Royal Hampton 10th (imp.) from Dora. Dora is by Pansy King, a son of Pansy 4th (imp.) by Lord Sandgrave, and yielded 7,868 lb. milk with an average test of 3·7 per cent, or equal to 342 lb. butter.

GUERNSEYS.—*King John: sire, King of the Roses (imp.); dam, Saucy Rose; calved 29th August, 1911; colour, lemon and white. Price, **£50.**

Saucy Rose is by Calm Prince from Rose Petal; she yielded 5,298 lb milk with an average test of 5 per cent. butter-fat, or a butter production of 311 lb.

***Belfast:** sire, King of the Roses (imp.); dam, Flaxy 2nd; calved 20th September, 1911; colour, lemon and white. Price, **£40.**

Flaxy 2nd is by Rose Prince (imp.) from Flaxy (imp.). Flaxy (imp.) in thirty-seven weeks gave 6,443 lb. of milk, which it is estimated produced 334 lb. of butter. Flaxy 2nd developed a habit of sucking herself, and the only record shows 3,333 lb. of milk testing 5 per cent.

AYRSHIRE.—*Childe Harold: sire, Byron; dam, Jock's Rose; calved 12th September, 1911; colour, brown and white Price, **£12.**

Byron is by Auchenbrain Spicy Jock (imp.) from Julia. Julia is by Peacemaker, by Mischiefmaker (imp.) from Juliette. Julia yielded 9,971 lb. of milk, testing 4·2 per cent., or equal to 492 lb of butter.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Beaucaire's Eaby: sire, Monsieur Beaucaire; dam, Rosey of Wollongbar; calved 28th March, 1911. Price, **£40.**

Confidence: sire, Royal Preel, by Itchen Preel from Hayes' Lily du Preel (imp.); dam, Faith, by Prince Souvia from Clatford Hopeful (imp.); calved 30th April, 1911. Price, **£45.**

AYRSHIRES.—Pride of Wollongbar: sire, Jamie's Heir; dam, Vanity of C.; calved 12th February, 1911. Price, **£9 9s.**

MacDuff: sire, Jamie's Heir; [dam, Auchen Rose; calved 29th December, 1910. Price, **£10 10s.**

H. C. L. ANDERSON, Under Secretary.

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* **Applications for these bulls will be held till 21st July, 1912 If more than one application be received** *for any one bull, his disposal will be decided by ballot.*

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	....	.... ..	Berry	*
Shorthorn	Pansy's Progress	Dora's Boy	Pansy 4th (imp).	Wollongbar Farm	*
"	March Pansy	Earl March	Australian Pansy.	Grafton Farm	*
"	Royal Pansy	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm	*
"	Thessalian II.	Thessalian (imp.).	Egyptian Princess (imp).	" "	*
"	Jamaica Jack	Sir Jack	Rum Omelette (imp).	Wollongbar Farm.	*
"	Xmas Fox (imp.)	Silver Fox	Malvoisie	Berry Farm	*
"	Kaid of Khartoum	Sir Jack	Egyptian Belle	Yanco Farm	*
Guernsey	The King's Mirro	Calm Prince	Vivid (imp.)	Swan Bay	11 Dec., '12.
"	Star Prince	Calm Prince	Vivid (imp.)	Kyogle	1 Feb., '13.
"	Sky Pilot	Prince Souvia	Parson's Red Rose (imp.).	Palmer's Island	15 Jan., '13.
"	Prince Souvia	Vivid's Prince	Souvenir (imp.)	Grafton	1 April, '13.
"	Sequel's Lad (imp.)	Sequel's Monogram.	Moss Rose of the Barras	H.A. College, Richmond	*
"	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '12.
"	Hayes' Fido (imp.)	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
"	Claudius	Golden Star II.	Claudia's Pride (imp.)	Tweed River	12 Aug., 12.
"	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad	Wild Eyes	Berry Farm	*
"	Calm Prince	Rose Prince (imp.).	Gentle (imp.)	" "	*
"	The Peacemaker	Calm Prince	Rose Petersen	Jones' Island	1 Dec., '12.
"	King of the Roses	Hayes' King	Rosey 8th (imp.).	Rookwood Asylum	23 Oct., '12.
"	Lauderlad	Laura's Boy	Souvenir of Wollongbar	Lismore	20 Dec., '12.
"	Royal Preel	Itchen Royal	Hayes' Lily du Preel (imp.)	Murwillumbah	10 Nov., '12.
Ayrshire	Jamie's Heir	Jamie of Oakbank	Miss Prim	Wollongbar Farm.	*
"	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose	Grafton Farm	*
"	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry	Kildare II	Kildare (imp.)	Belvedere Bratha 3rd (imp.).	" "	*
"	Bratha's Boy	Vieme Chin (imp.)	Bratha 4th	" "	*
"	Rising Sun	Bratha's Boy	Dawn	Bathurst Farm	*

*** Available for service only at the Farm where stationed.** † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be **obtained** on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

Society.	Secretary.	Date.
1912.		
Hay P. and A. Association	G. S. Camden	July 9, 10
Wentworth P., A., and I. Society	W. B. Crang	,, 17, 18
Deniliquin P. and A. Society	L. Harrison	,, 18, 19
Peak Hill P., A., and H. Association	A. Yeo	,, 24, 25
Condobolin P., A., and H. Association	A. Turner	,, 30, 31
Riverina P. and A. Society (Jerilderie)	J. Kennedy	,, 30, 31
Narrandera P. and A. Association	W. T. Lynch	Aug. 6, 7
Trundle P. and A. Association	L. Todd	,, 8, 9
National A. and I. Ass. of Queensland (Brisbane)	C. A. Arvier	,, 12-17
Coolamon A. and P. Association	E. Owen	,, 13, 14
Forbes P., A., and H. Association	J. H. Bates	,, 13, 14
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 20, 21, 22
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Corowa P., A., and H. Society	J. D. Fraser	,, 27, 28
Northern A. Association (Singleton)	F. A. Bennett	,, 28, 29, 30
Ariah Park P., A., H., and I. Association	J. N. Taylor	Sept. 3, 4
Manildra P. and A. Association	C. M. Podmore	,, 4
Grenfell P., A., H., and I. Association	Geo. Cousins	,, 4, 5
Germanton P., A., and H. Society	J. S. Stewart	,, 4, 5
Albury and Border P., A., and H. Society	W. I. Johnson	,, 10, 11, 12
Young P. and A. Association	G. S. Whiteman	,, 10, 11, 12
Cootamundra A., P., H., and I. Association	T. Williams	,, 17, 18
Cowra P., A., and H. Association	W. T. Fisher	,, 17, 18
Canowindra P., A., and H. Association	G. Newman	,, 24, 25
Ganmain A. and P. Association	J. F. Ashwood	,, 24, 25
Henty P. and A. Society	H. L. Yates	,, 24, 25
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25
Temora P. and A. Association	W. H. Byrnes	,, 24, 25, 26
Wellington A., P., and H. Association	A. E. Rotton	,, 25, 26
Millthorpe P. and A. Association	R. H. French	Oct. 1, 2
Lismore A. and I. Society	T. M. Hewitt	Nov. 6, 7, 8
Tweed River A. Society	A. E. Budd	,, 13, 14
Mullumbimby A. Society	W. O. Davis	,, 27, 28
1913.		
Albion Park A., H., and I. Association	M. A. Brown	Jan. 15, 16
Wollongong A., H., and I. Association	M. A. O'Donnell	,, 30, 31, Feb. 1.
Berry A. Association	C. W. Osborne	Feb. 5, 6
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 12, 13
Guyra P., A., and H. Association	P. N. Stevenson	,, 18, 19, 20
Central Cumberland A. and H. Association	H. A. Best	,, 21, 22
Dapto A. and H. Society	J. H. Lindsay	,, 25, 26
Southern New England P. and A. Association, Uralla.	W. McCrossin	Mar. 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 4, 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Camden A., H., and I. Society	A. Thompson	,, 5, 6, 7
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge	,, 11, 12, 13
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12, 13
Gundagai A. Society	A. Elworthy	,, 18, 19
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 26, 27
Cobar P. and A. Association	D. H. Dunlop	Apr. 5, 6
Clarence P. and A. Society (Grafton)	G. N. Small	,, 9, 10, 11
Moree P. and A. Society	D. E. Kirkby	,, 15, 16, 17

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VOL. XXIII PART 8. AUGUST 2, 1912.

Agricultural Gazette of New South Wales.

Field Experiments with Wheat, 1911.

DETAILS of these experiments up to the end of the season 1910 were published in the *Gazette* last year. The present series of reports embraces the season 1911.

The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for a few years or less. Later, when results for say five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.

III.—A FERTILISER TRIAL (PHOSPHORIC ACID SERIES).

[For report for 1910, see *Agricultural Gazette*, October, 1911, page 844.]

Object.—To determine the most suitable and economical source of phosphorus to use as a fertiliser for the staple and rotative crops of the different districts in which the experiment is planted, *i.e.*, to determine the effect of climate upon the availability of the phosphorus in the different commercial phosphatic manures.

The following phosphatic manures are being compared with each other, viz. :—

(1) Bone-dust.
(2) Superphosphate.
(3) Rock phosphate.
(4) Bone charcoal.
(5) Thomas' phosphate.

The relative and comparative value of the phosphorus from the different sources is determined by comparing the yields from plots fertilised with phosphorus obtained from the respective sources enumerated above, with the yields from check plots which have not received an application of any phosphatic fertiliser.

So that the effect of the application of the different phosphatic manures may not be influenced by a deficiency of nitrogen or potash, the nitrogen and potash content of each plot is maintained. The nitrogen content is kept up by the rotation adopted, the potash content by the application of sulphate of potash to each plot.

The amount of phosphorus and potash applied to any plot is what is considered sufficient to replace that removed by the system of cropping followed.

At the commencement of the experiment, provision was made for the fertiliser to supply per acre—

Phosphoric acid (P_2O_5)	15 lb.
Potash (K_2O)	15 lb.

As bone-dust contains a certain percentage of organic nitrogen and the other phosphatic manures do not, it is necessary to add organic nitrogen to all the phosphatic fertilisers except bone-dust, in order to make the conditions uniform for all the fertilisers. This is in the form of dried blood. The amount added is equivalent to that supplied by the bone-dust necessary to furnish the required amount of phosphorus.

The quantity of nitrogen, phosphorus, and potash added to the plots receiving such is the same for each.

The check plots do not receive any phosphatic manure, but as all the other plots, in addition to a phosphatic manure, receive (for reasons already stated) an application of nitrogen and potash, it is necessary to also apply the same amount of nitrogen and potash to the check plots.

As the check plots become depleted of their available phosphorus, it is considered that the effects of the application of the various phosphatic manures will become noticeable. The results can then be compared.

The actual differences due to the various fertilisers applied are not estimated by comparing the yields of the plots one with another, but by comparing the differences which exist between the actual yields of the plots and the yields which it is estimated they would have produced had they been planted as check plots. This estimate of "natural" yield is based upon the assumption that the differences between neighbouring check plots are due to regular and similar variations in the soil between them. The natural yield of any plot will therefore be intermediate between that of its two check plots, and proportionate to its distance from them.

COWRA EXPERIMENT FARM.

F. DITZELL, Experimentalist.

THIS experiment has been carried out in accordance with the general directions given above.

The rotation adopted is a two-course one, in which wheat alternates with a leguminous crop, the rotative crop grown at this Farm being field peas. The rotative crop is a legume, in order to keep up the nitrogen content of the soil, attention being directed to this in the general directions given above. On account of the rotation, two blocks are required, those reserved being two portions of H VI.

Prior to the commencement of the experiment, these blocks had been cropped and manured in a uniform manner, so that the land was in an even and suitable condition for the planting of this experiment. The land was cleared and broken up in 1906, and from then until the planting of this experiment it had been cropped as follows:—

1906.—Algerian oats, without fertiliser, for hay.

1907.—In the autumn, black tares (or vetches) were sown, to which a mixed fertiliser, composed of superphosphate 4 parts, and sulphate of potash 1 part, was applied at the rate of 54 lb. per acre. A self-sown crop of oats grew up amongst the tares, and was harvested for hay. After this a crop of cowpeas was sown, these being fed-off in the autumn of 1908.

1908.—Wheat, fertilised with superphosphate at the rate of about 40 lb. per acre.

1909.—Rape, fertilised with superphosphate, at the rate of about 40 lb. per acre, was sown in the autumn. Later in the year cowpeas were sown, and were fertilised with a mixture composed of superphosphate 4 parts and sulphate of potash 1 part, applied at the rate of 54 lb. per acre

Preparation of the Ground.

The preceding crop was Canada field peas, in accordance with the directions laid down for this experiment, and was harvested for grain (pulse) in December, 1910. The land was disc ploughed about 5 inches deep on and after the 1st March, 1911, and was harrowed on the 30th idem. It was again disc ploughed about 5 inches deep on and after the 3rd April, and was harrowed immediately afterwards. It was finally disc cultivated on the 15th June.

Planting.

The different plots were arranged as per sketch A (page 649), and were planted on the 27th June. The plots were 16 links wide to accommodate the width of the drill.

Bunyip was the variety of wheat sown, the rate of seeding being about 49 lb. per acre. The seed was treated with bluestone (2 per cent.) and lime-water, to prevent bunt.

The quantities of fertilisers applied per acre to the various plots are shown on sketch A. These were calculated from the analyses of the various fertilisers, so that each quantity of fertiliser would supply the amount of phosphoric acid (15 lb.), potash (15 lb.), and organic nitrogen (an amount equivalent to that supplied by the bone-dust necessary to supply the required amount of phosphoric acid), which it had been arranged to supply per acre. Each mixture of fertiliser or combination of fertilisers was previously mixed up with sand to a certain bulk, so that the drill was set to sow at the same rate, namely, 160 lb. of sand and fertiliser per acre.

The ground was in good planting condition as regards tilth, moisture, &c. The various plots were harrowed a couple of times during the winter to loosen the surface after a crust had been formed by rain.

Rainfall.

The rainfall recorded during the year, together with some remarks upon the season, were given in the June *Gazette*, page 474.

Observations during Growth.

On the 22nd September it was noted that all the plots, but especially plots Nos. 4 and 9, to which the phosphatic fertilisers superphosphate and Thomas phosphate, respectively, had been applied, had made a good growth. No differences between the other plots were noticeable.

The plots all commenced to ripen evenly about the 8th November. No increased earliness in ripening could be attributed to any one fertiliser when compared with the others.

Harvesting.

Before harvesting, the plots were reduced to one-ninth of an acre in area, by cutting off the ends. The several plots were harvested for grain with a stripper, and were winnowed on the 12th December, and from the weights thus recorded, which are those of a farmer's sample, the yields per acre have been computed.

Results.

Table I shows the results obtained from the two years for which this experiment has been in progress, and also the average of the same.

The results arranged in order of merit for both years and also the average of both years are as follow:—

1910.	1911.	Average for 1910 and 1911.
Unmanured.	Superphosphate.	Superphosphate.
Thomas phosphate.	Thomas phosphate.	Thomas phosphate.
Bone-dust.	Rock phosphate.	Unmanured.
Superphosphate.	Bone-dust.	Bone-dust.
Bone charcoal.	Unmanured.	Bone charcoal.
Rock phosphate.	Bone charcoal.	Rock phosphate.

As these results have been obtained in each year from ground in which the experiment has been planted for the first time, since the experiment is run on a two-course rotation, no definite conclusions can be drawn from them. It is pointed out in the general directions governing this experiment that the effects of the application of the various phosphatic fertilisers will become noticeable as the check plots become depleted of their available phosphorus, which will not be for a few years.

As the whole area has received two applications of superphosphate, and also two more of a mixture containing a large proportion of superphosphate, it is, therefore, too early to make comparisons between manured and unmanured plots.

The average yield of Bunyip from all the plots in this experiment was 13·68 bushels per acre. The previous year it was 34·331 bushels per acre. The average yield of the check plots was 33·29 bushels in 1910 and 13·61 bushels in 1911. This illustrates forcibly the difference between the two years of 1910 and 1911.

EXPERIMENT III.—Fertiliser Trial with Wheat, Cowra Experiment Farm, 1911.

Sketch A.

Length of each Plot—800 links.
Width—16 links.
Area—·128 acre.

Plot No. 1.	Unmanured.	DIVISION.
Plot No. 2.	Blood, 21 lb. per acre. Sulphate of potash, 29 lb. per acre.	*Check plot.*
Plot No. 3.	Bone-dust, 63 lb. per acre. Sulphate of potash, 29 lb. per acre.	
Plot No. 4.	Blood, 21 lb. per acre. Superphosphate, 87 lb. per acre. Sulphate of potash, 29 lb. per acre.	
Plot No. 5.	Blood, 21 lb. per acre. Sulphate of potash, 29 lb. per acre	*Check plot.*
Plot No. 6.	Blood, 21 lb. per acre Rock phosphate, 54·5 lb. per acre Sulphate of potash, 29 lb. per acre.	
Plot No. 7.	Blood, 21 lb. per acre. Bone charcoal, 50 lb per acre. Sulphate of potash, 29 lb. per acre.	
Plot No. 8.	Blood, 21 lb. per acre. Sulphate of potash, 29 lb. per acre.	*Check plot.*
Plot No. 9.	Blood, 21 lb per acre. Thomas phosphate, 81 lb. per acre. Sulphate of potash, 29 lb per acre.	
Plot No. 10.	Unmanured.	
Plot No. 11.	Blood, 21 lb. per acre. Sulphate of potash, 29 lb. per acre.	*Check plot.*
Plot No. 12.	Unmanured.	DIVISION.

TABLE I.—The results obtained from the use of Phosphatic Fertilisers.

Plot Number.	Fertiliser used on Plot.*	1910.			1911.			Average for 1910 and 1911.	
		Computed Yield Per Acre.	Natural Yield Per Acre.	Percentage Yield.	Computed Yield Per Acre.	Natural Yield Per Acre.	Percentage Yield.	Computed Yield Per Acre.	Percentage Yield.
		bushels.	bushels.		bushels.	bushels.		bushels.	
2	*Check Plot....*	31·83	31·83	100	13·35	13·35	100	22·59	100
3	Bone-dust	34·50	32·66	105·63	13·05	13·35	98	23·77	101·81
4	Superphosphate ...	35·00	33·50	104·47	14·85	13·35	111	24 92	107·73
5	*Check Plot....*	34·33	34·33	100	13·35	13·35	100	23·84	100
6	Rock Phosphate ..	33·33	34·27	97·25	13·50	13·65	99	23·41	98·12
7	Bone Charcoal ..	35·33	34·22	103·24	13·35	13·95	96	24·34	99·62
8	*Check Plot....*	34·16	34·16	100	14·25	14·25	100	24·20	100
9	Thomas Phosphate..	36·00	33·72	106·76	14·25	14·00	102	25·12	104·38
10	Unmanured... ...	36·00	33·28	108·17	13·35	13 75	97	24·67	102·58
11	*Check Plot ...*	32·83	32·83	100	13·50	13·50	100	23·16	100

* In addition to the phosphatic fertilisers mentioned, all the plots, except Nos. 3 and 10, received an application of dried blood and sulphate of potash. No. 3 received sulphate of potash only, as the bone-dust contains nitrogen. No. 10 was entirely unmanured. Sketch A shows the exact manuring. In this table the phosphatic manures only are given, as these were the manures compared, and which caused the differences in the yields.

WAGGA EXPERIMENT FARM.

R. W. McDIARMID, Experimentalist.

THIS experiment was commenced in 1910, and continued this year according to the same general plan governing it at the various Experiment Farms, the only alteration to the plan of last year being in the variety of wheat used. This year Federation was used.

Preparation of the Ground.

During 1909 sorghum was growing in this portion of the paddock. The crop was utilised for the dairy stock.

The paddock was ploughed with the mould-board plough in October, 1910, and harrowed. Cultivation was continued during the summer, to check weeds and conserve moisture. A second light ploughing was necessary in March, to get a suitable seed-bed for planting. Harrowing was twice done during April and May, and the experiment sown on 16th May, 1911.

Planting.

The plots were arranged in the same way, and the same manures applied, as in 1910. The variety of wheat used was Federation, which was treated with formalin, and sown at the rate of 30 lb. seed per acre. The amounts of fertilisers applied to each plot are given in the table of results, and the usual precautions were taken to enable the exact amounts to be applied.

At time of planting the ground was dry, and in fairly good condition for receiving the seed. Rain followed soon after planting, thus ensuring good germination.

On 10th August the whole of the block of plots was harrowed, this being the only after-cultivation given.

Harvesting.

These plots were harvested for grain only. A portion from the end of each was removed prior to harvesting. This was regulated to leave the plots exactly one-fourth acre in area. All the plots were harvested with the binder, and then later threshed.

Results.

Plot.	Manure per Acre.		Per Plot.	Per Acre.	Natural.	Percentage.
		lb.	lb.	bush.	bush.	
1 (*check*)...	Sulphate of potash .. Dried blood... ...	29 21	274	18·26	18·26	100
2	Sulphate of potash .. Bone-dust .. .	29 63	331	22·07	18·71	117·96
3	Sulphate of potash Superphosphate ... Dried blood . .	29 88 21	443	29·53	19·15	154·2
4 (*check*). .	Sulphate of potash . Dried blood	29 21	294	19·6	19·6	100
5 . .	Sulphate of potash.. Dried blood. . .. Rock phosphate ..	29 21 55	302	20·13	19·64	102·5
6 . .	Sulphate of potash .. Dried blood... .. Bone charcoal .	29 21 50	371	24·73	19·68	125·66
7 (*check*)..	Sulphate of potash Dried blood . .	29 21	296	19·73	19·73	100
8	Sulphate of potash Dried blood Thomas phosphate	29 21 81	375	25	19·18	130·34
9	No manure		275	18·33	18·62	98·44
10 (*check*)...	Sulphate of potash .. Dried blood... ...	29 21	271	18·07	18·07	100

(Average yield of check plots — 18·91 bushels per acre.)

Arranged in order of merit :—

1. Superphosphate.
2. Thomas phosphate.
3. Bone charcoal.
4. Bone-dust.
5. Rock phosphate.
6. Sulphate of potash and dried blood (only).
7. No manure.

Right from the germination and throughout growth, the plot that had received superphosphate looked superior to the others, and produced the highest yield of all plots in this season's experiments. The plot that received an application of Thomas phosphate showed the effect of it very early in the season; but at no stage did it look equal to the plot that had superphosphate. The remaining phosphatic fertilisers showed very little effect on the crop right through.

Diseases.

Flag-smut, rust, and loose-smut appeared in all the plots, but not to any extent. The flag-smut was the worst; and it may be interesting to note that this paddock has not grown wheat since 1904, but the seed was from a crop that contained it.

BATHURST EXPERIMENT FARM.

J. W. SHAW, Experimentalist.

THIS experiment was conducted at this Farm on the same lines as at other Experiment Farms.

Rotation and Previous Treatment.

The rotation adopted is a two-course one, in which wheat alternates with a fodder crop. The fodder crop, which consisted of rape, was sown on the 1st April, 1910, and was ploughed under at the end of October the same year. The land then remained as left by the plough until January, when it was again ploughed to a depth of 4 inches, to destroy weeds and maintain the mulch. Just prior to planting, the land was cross-ploughed to a depth of 4 inches.

Manures.

Prior to planting, the manures were mixed with fine earth to ensure even distribution, and run through the seed drill, in order to apply as nearly as practicable the exact quantity per acre when sowing in the field.

The manuring of each plot is shown in the table of results. Buffer plots, unmanured, were provided at each end of the block.

Planting.

The usual practice of treating the seed with bluestone and lime-water to prevent the occurrence of bunt was adopted. The strength of bluestone used was 1 lb. to 60 lb. of water. The plots were sown on the 21st April, at the rate of 30 lb. to the acre, Cleveland wheat being used.

Young Growth.

The effect of the different manures on the young growth was most marked in plots Nos. 3, 5, and 8, to which superphosphate, rock phosphate, and Thomas phosphate were applied.

Rainfall.

The rainfall for the year was given in the *Gazette* for June, 1912, page 485.

Results.

From the results given in the table, the manures may be arranged in order of merit, as follows:—

1. Superphosphate.
2. Thomas phosphate.
3. Bone charcoal.
4. Bone-dust.
5. Unmanured.
6. Rock phosphate.

From the above it will be seen that the best result was obtained from the plot to which superphosphate was applied. In the 1910 results the yields were apparently reduced by the use of superphosphate, bone-dust and bone charcoal giving the highest yield. It is only when the experiment has been in progress for a number of years that final conclusions may be drawn.

TABLE SHOWING RESULTS OF WHEAT EXPERIMENT III, BATHURST EXPERIMENT FARM, 1911.

Variety of Wheat: Cleveland.
Date planted: 21st April, 1911.
Date harvested: 11th December, 1911.
Area of plots harvested: ⅛ acre.

Plot No.	Manure per Acre		Plot Yield.	Acre Yield.	Natural Yield.	Percentage Yield.
		lb.	lb.	bush.	bush.	
1 (*check*)...	Blood .. ... Sulphate of potash	21 29	242	32·26	32·26	100
2	Bone-dust ... . Sulphate of potash	63 29	234	31·2	32·35	96·44
3	Blood . ... Superphosphate ... Sulphate of potash	21 87 29	249	33·2	32·44	102·34
4 (*check*)...	Blood .. ... Sulphate of potash	21 29	244	32·53	32·53	100
5	Blood ... .. Rock phosphate Sulphate of potash	21 54·5 29	232	30·93	33·06	93·55
6	Blood ... ... Bone charcoal ... Sulphate of potash	21 50 29	244	32·53	33·59	96·84
7 (*check*)...	Blood ... ... Sulphate of potash	21 29	256	34·13	34·13	100
8	Blood ... ... Thomas phosphate Sulphate of potash	21 81 29	243	32·4	33·42	96·94
9	Unmanured		232	30·93	32·71	94·55
10 (*check*)...	Blood ... ... Sulphate of potash	21 29	240	32	32	100

RESULTS OF EXPERIMENT III (FERTILISER TRIAL), GLEN INNES EXPERIMENT FARM, 1911.

Plot No.	Manure per Acre.		Hay.			Green Fodder.			Grain.		
			Computed.	Natural.	Percentage.	Computed.	Natural.	Percentage.	Computed.	Natural.	Percentage.
		lb.	t. c. q. lb.	t. c. q. lb.		t. c. q. lb.	t. c. q. lb.		bus.	bus.	
1 (*check*)...	Blood ... . Sulphate of potash.....	49·4 57·7	2 3 1 18	2 3 1 18	100	6 16 2 12	6 16 2 12	100	59·5	59·5	100
2 ...	Bonedust .. ... Sulphate of potash ...	166·6 57·7	2 15 3 12	2 5 1 26	122·8	7 12 2 22	6 11 1 5	116·3	62·05	58·65	105·8
3 ..	Superphosphate ... Blood ... ... Sulphate of potash ...	200 49·4 57·7	3 8 1 6	2 7 2 6	143·6	8 16 0 8	6 5 3 26	139·8	68·85	57·80	119·1
4 (*check*)...	Blood ... ... Sulphate of potash ...	49·4 57·7	2 9 2 15	2 9 2 15	100	6 0 2 19	6 0 2 19	100	56·95	56·95	100
5 ..	Rock phosphate ... Blood ... ... Sulphate of potash ...	125 49·4 57·7	2 12 0 24	2 10 0 27	103·9	6 5 0 8	5 19 1 6	104·8	52·7	56·53	93·2
6 ...	Bone charcoal . ... Sulphate of potash ... Blood	133·3 57·7 49·4	3 0 2 24	2 10 3 11	119·4	6 19 1 2	5 17 3 21	117·2	66·72	56·10	118·9
7 (*check*)...	Blood ... . .. Sulphate of potash ...	49·4 57·7	2 11 1 23	2 11 1 23	100	5 16 2 8	5 16 2 8	100	55·67	55·67	100
8 ...	Thomas phosphate .. Blood .. .. Sulphate of potash ..	222·2 49·9 57·7	3 0 0 12	2 11 0 22	117·4	6 16 0 14	5 16 3 13	116·6	60·35	57·51	104·9
9 ...	Nil		2 7 2 1	2 10 3 22	93·2	5 7 2 13	5 16 2 26	91·9	57·37	59·35	96·7
10 (*check*)...	Blood ... . Sulphate of potash ...	49·4 57·7	2 10 2 22	2 10 2 22	100	5 17 0 20	5 17 0 20	100	61·2	61·2	100

GLEN INNES EXPERIMENT FARM.

H. BARTLETT, Experimentalist.

THIS experiment was carried out at Glen Innes Experiment Farm with Algerian oats, sown at the rate of 45 lb. per acre.

The season was all that could be desired for the early varieties of oats, such as Algerian, and excellent yields were obtained. No rust was present, and the harvest conditions were exceptionally favourable.

The yields are shown in the table on page 654. For this year superphosphate gave the best results for both hay and grain. The manures may be placed in the following order, but it is emphasised that these are the results of one season's trial only :—

For Hay : Superphosphate ;
Bone-dust ;
Bone charcoal ;
Thomas phosphate ;
Rock phosphate.

For Grain : Superphosphate ;
Bone charcoal ;
Bone-dust ;
Thomas phosphate ;
Rock phosphate.

NYNGAN DEMONSTRATION FARM.

E. BARING, Experimentalist.

WHEAT Experiment No. 111 was carried out at Nyngan Demonstration Farm, together with other experiments, in accordance with general instructions issued by the Experiments Supervision Committee.

The land was cleared early in 1911, disc ploughed 6 inches deep in February, and broken down with the spring-tooth cultivator and harrows.

The experiment was sown on 22nd and 23rd May, 1911, the variety of wheat being Steinwedel. The seed was sown at the rate of 33 lb. per acre. The area of each plot was ·1155 acre.

The results are given in the following table.

RESULTS OF EXPERIMENT III (FERTILISER TRIAL), NYNGAN DEMONSTRATION FARM, 1911.

Plot No.	Manure per Acre.	Hay.			Grain.		
		Computed.	Natural.	Percentage.	Computed.	Natural.	Percentage.
		lb.	lb.		lb.	lb.	
1 (*check*)	Dried blood, 15 lb. ; sulphate of potash, 15 lb.	1,287·5	1,287·5	100	253	253	100
2	Bone-dust, 50 lb. ; sulphate of potash, 15 lb.	1,350·	1,287·5	104·85	237·5	231·2	102·72
3	Superphosphate, 60 lb. + check plot manure	1,337·5	1,287·5	103·87	178	209·3	85·05
4 (*check*)	Dried blood, 15 lb. ; sulphate of potash, 15 lb.	1,287·5	1,287·5	100	187·5	187·5	100
5	Rock phosphate, 37½ lb. + check plot manure	1,227·5	1,320·8	92·93	197	188·6	104·45
6	Bone-char, 40 lb. + check plot manure	1,275·	1,354·2	94·15	194	189·8	102·21
7 (*check*)	Dried blood, 15 lb. ; sulphate of potash, 15 lb.	1,387·5	1,387·5	100	191	191	100
8	Thomas phosphate, 66⅔ lb. + check plot manure	1,487·5	1,362·5	109·17	175	200·3	87·86
9	Nil	1,225·	1,337·5	91·58	194	209·7	92 51
10 (*check*)	Dried blood, 15 lb ; sulphate of potash, 15 lb.	1,312·5	1,312·5	100	219	219	100

SOME POINTS IN ROTATION OF CROPS.

THE United States Department of Agriculture, in co-operation with the Minnesota Agricultural Experiment Station, has issued Bulletin No 236 of the Bureau of Plant Industry—"Farm Management." The Bulletin gives results of trials of different crop rotations in Minnesota, carried on from 1895 to 1909, with net profits per acre. Much of the data will not apply to our conditions, but the following general conclusions should be valuable to farmers designing rotations of crops in different districts:—

(1.) Cultivated crops, as maize, potatoes, and mangels, grown continuously, rapidly decrease the productivity of soils. This is largely due to the fact that cultivation stimulates decomposition of vegetable matter, leaving too small a supply of fresh vegetable matter in the soil.

(2.) Grain crops grown continuously decrease the productivity of soils. This is believed to be due partly to reduction of fresh vegetable matter, and partly to increase in weeds.

(3.) A rotation of maize, oats, millet, and barley, which tend to exhaust the vegetable matter, did not produce better results than continuous wheat cropping.

(4.) A two-year rotation of mangels and wheat, both of which reduce vegetable matter, gave little better yields of wheat than wheat continuously.

(5.) A two-year rotation of wheat and annual pasture gave greatly increased yields of wheat, because the annual pasture crop added fresh vegetable matter to the soil.

(6.) A three-year rotation of maize, wheat, and clover, with no manure, did not give as large yields of maize and wheat as were obtained from a five-year "standard" rotation of maize, wheat, meadow, pasture, and oats, with some manure applied to the maize. Clover once in three years did not maintain the supply of fresh vegetable matter so fully as the five-year rotation with two grass crops and 8 tons of manure once every five years.

Of course this "standard" rotation would not apply to the conditions throughout New South Wales; but the authorities quoted show the great necessity in any rotation of providing for a continuous supply of fresh vegetable matter in the soil. Continuous cropping with grain, including rotation of small grains with maize, reduces the vegetable matter in the soil.

MAIZE *v.* WHEAT IN CONTINUOUS CROPPING.

IN rotation trials conducted at Minnesota Experiment Farm (Bulletin 236, Bureau of Plant Industry, United States Department of Agriculture), wheat grown continuously for fifteen years (1895 to 1909) on the same ground, gave a small net profit; but maize grown continuously gave a small net loss This may be a surprise to many, as it is generally believed that maize has no harmful effect upon the soil, whilst wheat has the reputation of being hard on the soil. The authorities offer the explanation that the frequent cultivation given to the maize stimulates decomposition, so that the vegetable matter is more rapidly depleted than when wheat is grown continuously.

Beyond the Wheat-belt.

H. J. KELLY, Manager, Nyngan Demonstration Farm.

DURING recent years much has been said and written concerning the extension of the wheat-belt westwards, and the success already achieved by the adoption of scientific methods of agriculture, in conjunction with the use of new varieties which have been produced to suit the western conditions, justify the belief that ere many years pass, wheat growing will be profitably carried on many miles west of Coghlan's wheat line, which at present is considered to mark the western boundary of the safe wheat-belt.

In the past, many attempts, with varying results, have been made by the far western landholders to grow sufficient hay for station requirements, and some have even undertaken, as a side line, the production of grain crops. Generally speaking, however, such attempts have been only of a speculative character, and the luck of a good season happening has been relied on for success. During the past few years, some have entered into the undertaking in a more thorough and businesslike manner. Realising that in the past many failures could have been averted, if only a comparatively small amount of extra work had been done in the preparation of the land, they now follow a system which entails more labour, certainly, but which leaves much less to chance, and consequently they are being rewarded with much more success than was achieved in the past.

By following haphazard methods, probably the crops beyond the safe area would prove complete failures two seasons in five, and the three which would be comparatively successful would yield much less than if advanced methods of farming were adopted. The chief cause which militates against profitable agriculture in this vast area, is the inadequate and unreliable rainfall during the growing period. Taking the average annual rainfall, which over a great portion of this area reaches to 17 inches, it would appear to those familiar with the conditions of other parts which have about an equal or perhaps only a slightly better annual rainfall, but which for wheat-growing is distributed more opportunely, that it should be an easy matter to produce payable crops here. Remembering, however, that the major portion of the rain falls, as a rule, during three or four months in the summer, and that owing to the excessive summer heat, and the prevalence of drying winds, the evaporation is exceedingly great, the question of carrying on agricultural pursuits successfully presents a different aspect.

Wheat-growing for grain or hay, by itself, may never pay in the far west, but, combined with the pastoral industry, it can and will be found to be most remunerative. The essentials are a system of fallowing, and a crop rotation, which provides for the growing of suitable fodder crops that can either be fed-off or turned into silage or other form of conserved fodder, and which at the same time keeps up the standard of fertility and moisture-holding capacity of the soil, so necessary to the growing of wheat.

A great diversity of opinion exists as to the extent of a living area. Some maintain that sufficient land is required to graze from 2,000 to 3,000 sheep, in order that a comfortable living may be made, and sufficient laid by to provide for old age, while others aver that much less than that amount is ample. If the contention is correct, that a holding capable of carrying 2,000 sheep is required for the maintenance of a family, then in many places 8,000 acres would be required under strictly pastoral conditions. The area may, however, comprise much land that is suitable for agricultural purposes, and when it is not put to that use it is not being worked to the best advantage.

Take, as an example, a holding comprising 5,000 acres, with a capacity for carrying, on the average, 1,500 sheep, when improved for grazing purposes. With the introduction of agriculture on up-to-date lines, this holding should be made to carry safely at least 2,500 sheep, besides having available for disposal occasionally, after sufficient has been reserved for its own requirements, the surplus produce that has been grown; and probably highly remunerative prices will be received for the surplus fodder when dry periods occur. On such a holding at least 600 acres, and preferably 1,000 acres, should be brought under cultivation, and each year one-third should be cropped with wheat, one-third with fodder crops, the remaining third being fallowed for the ensuing wheat crop.

The fodder crops should be divided into two sections, viz., summer and winter, and the planting of each should be preceded by a period of bare fallow, as long as the interval between it and the removal of the previous wheat crop will allow. Thus if 600 acres were the extent of the cultivation area, in each twelve months 200 acres would be planted with wheat, 200 acres would be in bare fallow preparing for the succeeding year's wheat crop, while 100 acres would be planted in the spring with cowpeas or other suitable summer crop, and the remaining 100 acres would be planted in early autumn with rape and other crops which are suitable for winter growth.

In ordinary seasons the above acreage of fodder crops would supplement the pastures to such an extent that unless many more than the number of sheep quoted were carried on the holding, the chances of overstocking would be remote. On the other hand, should the season prove dry, and the natural pastures become dried up to such a condition that of themselves they were insufficient for the proper nourishment of stock, the addition of succulent cultivated fodder crops would be invaluable, and at such periods the settler who had undertaken to work his holding under such a system, would have little to fear, and would not be faced with the anxiety and expense of removing his stock to agistment country, in order to carry them through.

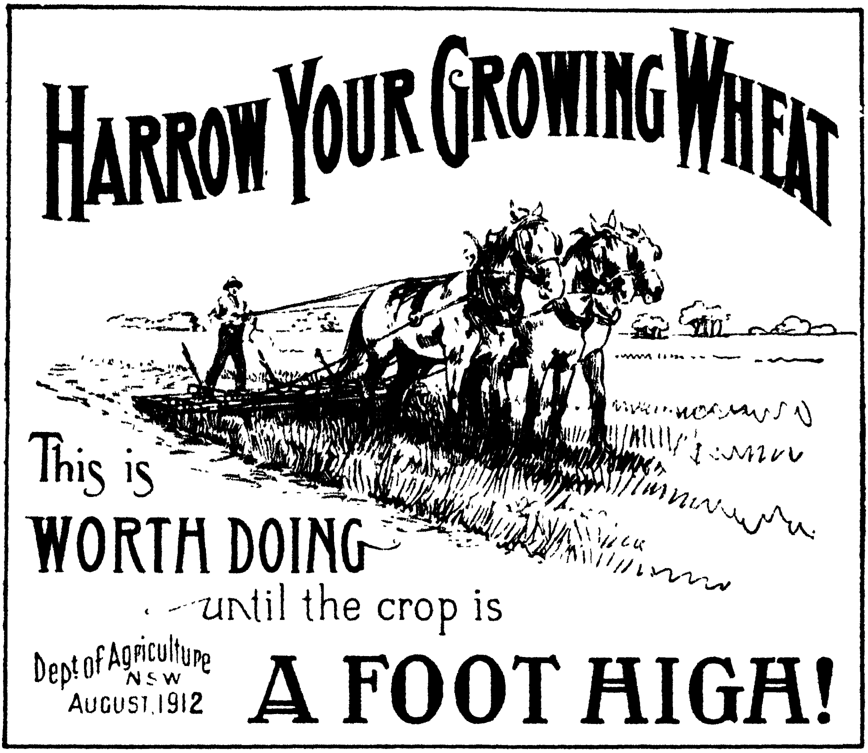
The cost of working a holding on such lines would certainly be greater than running it solely as a grazing area, but as it would greatly increase the carrying capacity besides bringing in revenue from other sources, the profits would be greater and much more certain. The initial expense of clearing and fencing land would vary according to situation and the class of country to be dealt with. In some cases sufficient areas could be made ready for the plough at small cost, while in others it might cost as high as £2 per acre to clear. But once it is proved that cultivation will pay, the trouble and expense of clearing the land will be overcome by those who resolve to enter into the undertaking, no matter what class of country they occupy.

The horses and plant necessary for agricultural purposes are the next items for consideration; but as on most holdings of this size some draught horses are kept to do occasional work, these would considerably lessen the expenditure necessary for a full team, and as they are required for other work in connection with the pastoral section of the area, at certain periods, the total cost of horse purchases would rarely have to be charged to farming account. A team of five or six horses, constantly employed, could work, except at harvest time, an area of 500 to 600 acres in the manner here outlined. Thus profitable and constant work could be found for men and horses all the year round, and the extra work and expense at harvest time would be gladly welcomed, if good crops were to be harvested.

As with other pursuits, the application of this system would vary considerably with different farmers, as each would be controlled by his special circumstances, but the spare time which now exists in the slack seasons, and the time and money now spent in combating droughts under present conditions, could be much more profitably employed as indicated. When the great possibilities that exist in the West are fully recognised; when the land is worked to the best advantage, and provision made for an adequate water supply; the living area of to-day can be considerably reduced. This will provide homes for more people, remove the feeling of isolation from the now necessarily scattered dwellings, and otherwise improve the social conditions. It will rob drought of its terrors, and give to the residents that feeling of security which dwellers in more favoured districts at present enjoy.

THE PERMANENT VALUE OF PHOSPHATIC MANURES.

IN the *Agricultural Journal of Egypt*, Messrs. Frank Hughes and Raphael Aladjem, Analysts of the Department of Agriculture, give results of some investigations in the neighbourhood of the Kom at Sakha, the site of one of the oldest cities of Egypt. For 4,000 years at least before the Arab domination of the country, a considerable population existed there. The refuse of the city was used as manure, and of course distributed over a smaller area than that from which the produce was drawn. Analyses of the soils near the site of the old town showed that up to a distance of one kilometre from the Kom, the total phosphoric acid averaged 0·34 per cent., but it decreased as the distance increased, until at 4 to 5 kilometres it only averaged 0·22 per cent. The soluble phosphoric acid decreased from ·086 to ·036 per cent. Whether the potash has also been concentrated and preserved in the same way is not yet determined, but the nitrogen has long since been converted into nitrate, and washed away or denitrified.



HARROWING THE WHEAT.

A. H. E. McDONALD, Inspector of Agriculture, North-west District.

THE wheat crops will be very materially assisted this season by harrowing. This should be done as soon as the wheat is well rooted. The splendid rains of June and July thoroughly saturated the subsoil, and as much of the moisture as possible should be conserved. Although the virtue of harrowing the crops is pretty well admitted, the why and the when of the operation are not at all universally understood, and through this want of knowledge harm is sometimes done to the crops.

Harrowing is chiefly beneficial because it is a means of preventing evaporation. Some other advantages are claimed for it, as, for instance, that it causes the wheat to tiller better; but these are comparatively unimportant. Rain makes the soil compact through bringing the individual particles together, and then the moisture can move very freely from one to the other. The wind and heat play on the surface of the earth, and abstract the moisture. The surface particles thus become drier than those immediately below, and the moisture moves up to them until they become as moist. As the evaporation at the surface continues, an equality of moistness cannot be secured, and thus there is a continual upward rise and loss of the moisture. It is the farmer's duty, therefore, to prevent the moisture rising, and to keep it down in the lower soil where the plant roots are. This he can do by shifting and loosening all the particles on the surface. Little spaces are created between the particles, and these prevent the upward rise of water.

From a consideration of these facts, the right time to harrow can easily be deduced. If the soil contains moisture in the subsoil—as all soils do to a greater or less extent, whether it has rained just recently or not—and the surface is tight or compact, then harrowing should be done. Since rain again makes the surface compact, it may be advisable to harrow a crop a second time if it rains after the first operation, and the crop is not yet too high. On the other hand, if the soil is loose and open on the surface, no good can result from harrowing. Last season many farmers harrowed their crops when it was not required; but it may be said that this season, after the soaking rains that have been experienced, nearly every paddock will be benefited by it. The loosening of the surface will conserve an enormous amount of moisture that will be very useful when the hot days of summer come along

Do it now.

A LUCERNE SEED "PREPARATOR."

IN Bulletin No. 133 of the South Dakota Experiment Station, results are given of some trials with this machine, devised by Dr. Nilsson, Director of the Experiment Station at Svalof, Sweden. The machine consists essentially of a hopper for holding seed, so arranged that seed may run through it and drop upon a revolving disc, to be thrown by centrifugal force against the concave surface of a circular, rough stone, within which the disc revolves. The revolving disc is turned by the revolutions of a crank wheel, belted to a similar wheel. The philosophy of the process is that the seeds have their seed-coats indented or scratched, and thereby weakened slightly, so that the seed may more easily absorb water, and the seed coat may be more easily broken by the expanding germ when the seeds are subjected to conditions which promote growth.

The average of a number of tests at the South Dakota Station, showed that 99½ per cent. of lucerne seeds subjected to this process germinated between moistened blotters, while 91½ per cent. of untreated seeds germinated under the same conditions—a difference of 8 per cent. in favour of the treatment. There is no mention of any trials of germination in the field, so readers must be left to draw their own conclusions as to whether the 8 per cent. advantage would be increased or lessened if seed for ordinary use were subjected to the treatment.

Insectivorous Birds of New South Wales.

[Continued from page 235.]

29. Babbler.

THERE are four species of *Pomatostomus* found within New South Wales, the one illustrated being the most widely distributed. It is known under various local names, such as "Cat-bird," "Chatterer," "Follow Me," "Barking Bird," &c. In some inland districts, groups of these birds are called "Twelve Apostles"; but this name is usually reserved for another species of similar habit (*Struthidea cinerea*). Both birds are insectivorous, so that we may say that the birds known in inland districts as "Twelve Apostles" should be protected, irrespective of which species is referred to under that name.

The Babblers are exceedingly restless and noisy birds. They are generally found in groups of from half-a-dozen to a dozen, distributed throughout the Western and Central portions of the State—usually in pine scrub, or open forest country. They are partly ground birds, never flying to any great distance, but hopping to the base of a tree, and jumping up from limb to limb, all the while maintaining an indescribable mixture of harsh cries, anything but pleasing to the ear.

The birds combine in building their nests, which are dome-shaped, with a narrow entrance, the top projecting so as to form a kind of porch. The materials are usually thin sticks and long twigs, lined with bark fibre, grass, cow-dung, or wool. The nests are placed from 10 to 20 feet above the ground, in pine, acacia, or gum trees. The birds are enthusiastic builders, and construct many nests that are not used for the reception of eggs, but abandoned in more or less complete condition. There are from three to five eggs to a sitting, and the markings take the form of fine marbling in purple browns or dull greens, with numerous hair lines in black over all. The breeding season extends from May to November.

Another species, *Pomatostomus temporalis*, is very common, and in some places it has been called the "Codlin moth eater," on account of its partiality for this pest [Hall]. Mr. North examined stomachs of these birds from Lake Cudgellico, and found them to contain the remains of beetles, mixed with a quantity of fine red sand and gravel. Anybody who cares to watch a group of Babblers at work, turning over pieces of manure or rubbish on the ground in search of insects, will soon be convinced of their value in keeping insect life in check.

30. Brown Tree-creeper.

The Tree-creepers, of which there are seven species in Australia, are our nearest approach to the Woodpeckers of Europe. The bird illustrated is generally found in the pine and mallee scrubs of the interior, while the White-throated Tree-creeper prefers the neighbourhood of creeks. But this restriction of locality is not by any means complete, and the Brown Tree-creeper is fairly common in open forests near the coast. Still it is essentially a dry country bird, and Mr. Hall points out that it needs little water, and is rarely seen to drink.

Both species obtain their food in a similar way, from the trunks and main limbs of eucalypts and other forest trees. They commence at the bottom, and ascend the tree by a spiral or zig-zag course, searching every nook and crevice in the bark; and, as Mr. North points out, among others many a wood-borer or other timber-destroying insect is captured. The larger branches are examined in the same way, and then the bird flies off to the base of another tree. Some of their food, however, is obtained on the wing, after the manner of the Flycatchers.

The nest is placed in the hollow spout of a decaying limb, or similar situation, and consists of a mattress of opossum or rabbit fur, sometimes mixed with dried grass. Two or three eggs of a rich red-streaked colour are laid for a sitting, August and the four following months being the breeding season.

In both the pictures the birds are shown at half the natural size.

CREOSOTE FOR FENCE POSTS.

IN Circular No. 51, the Missouri Experiment Station advocates the use of creosote as a preservative for fence posts. It is stated that by this means wood otherwise unsuitable, because of its rapid decay, can be made serviceable, and wood of smaller diameter can be used—5-inch average diameter is said to be large and strong enough for line posts. A creosoted post of perishable wood will outlast by many years the most durable fence post.

The wood needs to be thoroughly seasoned, and requires to be immersed in boiling creosote for several hours, and then for about an equal length of time in cold creosote. The reason of the double treatment is that the heat causes the air and water in the post to expand and be forced out, and then its place is taken by creosote when the wood cools. This forms a shell of creosoted wood, one-eighth to two inches thick around the post, which excludes moisture and the fungi which cause decay.

It is regarded as sufficient to treat the bottom 40 inches of the post, so that the portion in the ground and a little above will be protected. For farm use one tank is sufficient. An old iron boiler is suitable. A galvanized iron tank has too thin a bottom. Fill the tank with posts in the morning, and build a fire under it which will last about two hours before burning out. The posts will cool down during the day, and by night will be treated. More posts can then be put in, heated, and allowed to cool during the night. In cool weather, three runs can be done per day.

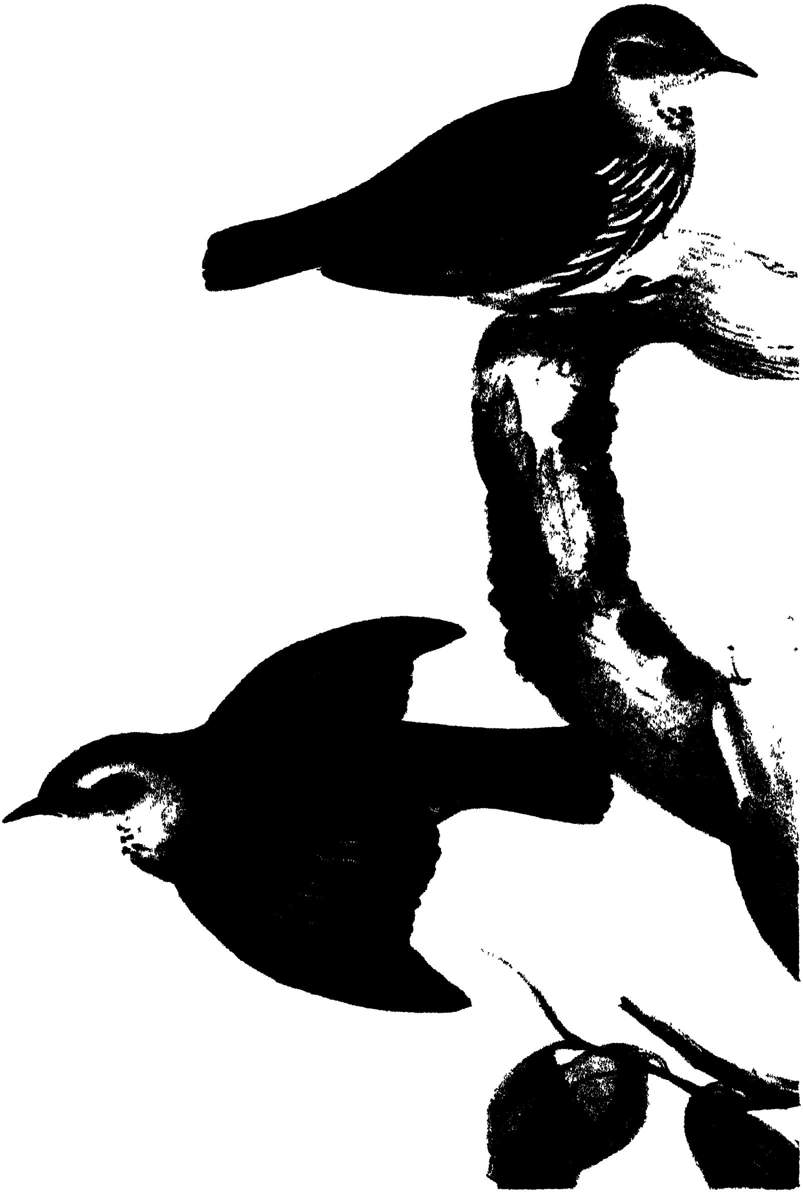
A gallon of creosote should treat three or four posts or more, according to the wood. Prices run to about 2s. per gallon.

Mr. A. Brooks, Works Overseer of this Department, wishes to emphasise the fact that the wood must be thoroughly seasoned. Otherwise, the effect of the treatment will be to hasten decay by encasing the sap and moisture.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"BABBLER."

Pomatostomus superciliosus, Vig. and Hors.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"BROWN TREE CREEPER."

Climacteris scandens, Temm.

Notes on Wheats competing for Prizes at the Royal Agricultural Society's Show.

EASTER, 1912.

F. B. GUTHRIE.

THE number of entries in the wheat section was about the same as in 1911, and about the same number were put through the mill in order finally to allot the prizes.

The wheats were on the whole a fine lot, though not quite up to the standard of 1911. Wet weather at harvest time in many parts of the State affected the appearance of the grain, which in several cases was slightly bleached and weathered. The bushel-weights were similarly affected, only a few going over 66 lb. per bushel, whereas in 1911 a considerable number were above this weight.

In this connection, the high bushel-weight of the wheat known as Petatz' Surprise is worthy of remark. The weight of the sample of this year's exhibit was 67 lb. per bushel, being the highest weight recorded this year, the next highest weight being 66¼ lb. This wheat is a consistently high scorer in the matter of bushel-weight, being highest at the 1911 Show with 66½ lb., and nearly the highest with the same weight in 1910. In 1909 it was again the heaviest wheat, with a weight of 67½ lb. per bushel. This wheat is more largely grown in South Australia than here.

In the matter of flour-strength also there is an appreciable falling off, the six samples of the Strong White class which were milled this year yielding an average of 52·7 quarts of water absorbed by the 200 lb. sack of flour, as against 53·4 quarts last year.

In the case of the Soft White or weak-flour class, this falling off in strength is even more marked, the eight samples milled in this class last year having an average water-absorbing power of 47 quarts, whereas this year the average of the nine samples milled is only 45·2 quarts.

The average gluten content of the Strong White (Farrer) wheats is greater this year by nearly 1 per cent., being 13·4 as against 12·5 last year. The gluten content of the Soft White class of wheat has, however, slightly diminished, from 11·0 per cent. last year to 10·6 per cent. this year.

The following table is of interest in this connection. It shows the average gluten-content and water-absorptive power of the flour of the wheat milled in the two classes, Strong White and Soft White, each year since 1905. The averages are taken from the reports on the Show wheats which have been published annually in the *Agricultural Gazette*.

AVERAGE Gluten-content and Water-absorbing power of Wheats (Strong White and Soft White) milled at the Royal Agricultural Society's Shows from 1905 to 1912.

Year	Gluten.		Flour-strength (water absorption).	
	Strong White.	Soft White.	Strong White.	Soft White.
1905	10·0	9·7	46·6	45·2
1906	11·0	9·8	48·5	45·7
1907	9·3	8·3	48·4	45·4
1908	12·2	10·2	52·5	46·4
1909	11·9	8·6	53·5	49·2
1910	13·8	12·1	50·0	47·8
1911	12·5	11·0	53·4	47·0
1912	13·4	10·6	52·7	45·2

For the benefit of those who wish to verify the above figures, the two following points may be noted:—

1. The title "Strong White" has replaced that of "Medium Hard" since 1910. The wheats competing in this class are the same, and are practically confined to the strong-flour Farrer wheats, Comeback, Bobs, and Jonathan.

2. Since 1908 the water-absorbing power has been calculated on a different basis; consequently the figures published in the *Gazette* for this property up to 1908 will be found to be higher than those now given. In the table presented above these older figures have been reduced to the standard now adopted, in order to make them all uniform.

It will be seen on examining this table that there are considerable fluctuations annually with regard to the gluten-content and flour-strength (measured by the water-absorptive power), but that on the whole there is a steady advance in the case of the Strong White class (Farrer wheats) in both gluten-content and strength. There is certainly no ground whatever for the fear which is sometimes voiced that these wheats are in any way deteriorating in these qualities.

In the case of the Soft White wheats, the gluten-content and flour-strength, though consistently lower than is the case with the strong-flour varieties, vary with the seasons, but are on the whole stationary, the average flour-strength of the 1912 samples being identical with that of the 1905 samples.

The champion prize was awarded this year to a sample of Cedar, which is a cross-bred, made by the late Mr. Farrer, containing about three-quarters Manitoba (Fife) and one-quarter Indian blood. It is a red grain, belonging to the hard red class, which includes the Manitoba and Fife wheats. Cedar is, in fact, a Fife wheat crossed with Indian blood with the object of improving it for local conditions. This sample was grown by Mr. W. J. Clonan in the Gunnedah district. The yield per acre was low, being only 9 bushels, but the crop only received 4·39 inches of rain during the period of growth. Cedar, grown by Mr. Smith Pollock, Quirindi, also gained the second prize in this class. In this case the yield, with a rainfall during the crop's growth of 6·34 inches, was 16 bushels. Cedar cannot therefore be regarded as so good a yielding crop as wheats like Bobs or Comeback.

The first and second prizes in their class (Strong White) were taken by Mr. Smith Pollock, Quirindi. Bobs yielded 36 bushels per acre, and Comeback 29, the rainfall during the growth of the crops being 8½ inches.

The judging was carried out as in previous years. The bushel-weight of all the samples was taken, and the results are given in the first of the tables which follow.

After careful inspection to eliminate the inferior exhibits, those which were considered eligible for prizes were milled on the small model mill of the Department of Agriculture, and the prizes were finally awarded in accordance with their actual behaviour in the mill, marks being assigned to the different milling characteristics. The result of these tests will be found in the table headed "Results of Milling Tests," in which table the figures within brackets give the actual milling results, the other figures giving the marks obtained.

The judges were Messrs. R. W. Harris, head miller, Gillespie Bros., and G. W. Norris, Chemist's Branch, Department of Agriculture; the milling of the samples being carried out by Mr. Norris.

WEIGHTS PER BUSHEL.

Catalogue No.	Variety.	Bushel-weight	Catalogue No.	Variety	Bushel-weight.
	Class 756 (Macaroni Wheat).				
5086	Indian Runner	63	5088	Medeah	62½
5087	Medeah	63½			
	Class 757 (Hard Red).				
5089	Cedar	66	5093	Haynes' Blue-stem	60½
5090	Manitoba	63½	5094	Manitoba	62¾
5091	Cedar	65¾	5095	Cedar	62¾
5092	Power's Fife	61¾			
	Class 758 (Strong White).				
5096	Comeback	65¼	5111	Bobs	64
5097	,,	64	5112	Florence	64¼
5098	,,	65½	5113	Bobs	65½
5099	,,	66	5114	Comeback	65¼
5100	Bobs	65¾	5115	Bobs	66¼
5101	Comeback	65¼	5116	Comeback	65¼
5102	,,	65½	5117	Bobs	65½
5103	,,	64¼	5118	Comeback	65¼
5104	,,	66¼	5119	,,	65¾
5105	Bobs	64	5120	Bobs	63½
5106	Comeback	65¼	5121	Comeback	64¼
5107	Bobs	65	5122	,,	64¼
5108	Comeback	64¼	5123	Towri Comeback	64½
5109	Jonathan	63¾	5124	Florence	64¾
5110	Bobs	65¼			

Class 759 (Soft White).

Catalogue No.	Variety.	Bushel-weight. lb.	Catalogue No.	Variety.	Bushel-weight. lb.
5125	Purple Straw	65¼	5138	Yandilla King	61¾
5126	Federation	64¼	5139	Marshall's No. 3	64¼
5127	Petatz' Surprise	67	5140	Bunyip	65
5128	Jade	65	5141	Federation	63¼
5129	Bunyip	62	5142	Steinwedel	65¾
5130	,,	64¾	5143	Bunyip	65
5131	,,	64½	5144	Jade	63¾
5132	,,	65½	5145	Rymer	61½
5133	Dart's Imperial	65	5146	Federation	64¼
5134	Purple Straw	63	5147	Bayah	63
5135	Jade	64	5148	Marshall's No. 3	64¾
5136	Budd's Early	65¼	5149	,,	63¼
5137	Warren	62¼			

Special Prize (Collection of Five Farrer Wheats).

Catalogue No.	Variety.	Bushel-weight. lb.	Catalogue No.	Variety.	Bushel-weight. lb.
5150	Bobs	65¼	5151	Comeback	66¼
	Jade	64½		Bobs	66½
	Bunyip	64¼		Federation	64
	Comeback	65		Bunyip	65
	Federation	62¼		Florence	65
5152	Bobs	65¾	5153	Federation	61½
	Comeback	65¾		Bobs	63¾
	Bunyip	65¼		Comeback	64¼
	Federation	63¼		Rymer	64¾
	Rymer	64¾		Bayah	66¼

Special Prize (Collection of Five non-Farrer Wheats).

Catalogue No.	Variety.	Bushel-weight. lb.	Catalogue No.	Variety.	Bushel-weight. lb.
5154	Marshall's No. 3	64¼	5155	Steinwedel	65¼
	Dart's Imperial	65¼		Marshall's No. 3	64
	Purple Straw	65		Yandilla King	62¾
	Steinwedel	66		White Lammas	63¼
	Manitoba	63¾		Red Tuscan	66¼

Milling results are given on page 670.

Awards.

Class 756—Macaroni.	First Prize, No. 5087, Smith Pollock, Medeah, grown at Glengarry, Quirindi, on red soil. Seed per acre, 45 lb.; yield per acre, 27 bushels; rain during growth, 7·36 inches. Autumn ploughing. Second Prize (not awarded).
Class 757— Hard Red.	First Prize, No. 5089, William J. Clonan, Cedar, grown at Uralba, Emerald Hill, on red soil. Seed per acre, 45 lb.; yield per acre, 9 bushels; rain during growth, 4·39 inches. Autumn ploughing. Second Prize, No. 5091, Smith Pollock, Cedar, grown at Glengarry, Quirindi, on black soil. Seed per acre, 45 lb.; yield per acre, 16 bushels; rain during growth, 6·34 inches. Autumn ploughing.
Class 758.— Strong White.	First Prize, No. 5113, Smith Pollock, Bobs, grown at Glengarry, Quirindi, on black soil. Seed per acre, 45 lb.; yield per acre, 36 bushels; rain during growth, 8·5 inches. Autumn ploughing. Second Prize, No. 5114, Smith Pollock, Comeback, grown at Glengarry, Quirindi, on black soil. Seed per acre, 45 lb.; yield per acre, 29 bushels; rain during growth, 8·5 inches. Autumn ploughing.

Class 759. — Soft White.	First Prize, No. 5131, J. D. Hunter, Bunyip, grown at Young, on free loam. Seed per acre, 45 lb.; yield per acre, 35 bushels. Autumn ploughing. Second Prize, No. 5132, William Lange, Bunyip, grown at West Wyalong, on clay loam. Seed per acre, 35 lb.; yield per acre, 18 bushels; rain during growth, 6·85 inches; on fallowed land.

Champion Prize for the best bag of wheat exhibited: No. 5089, Cedar, grown by W. J. Clonan.

Special Prize for the best collection of five Farrer Wheats.

First Prize, No. 5151, Alfred J. Pankhurst, Tamworth.

Variety.	Seed.	Yield	Rainfall	Soil, etc
Comeback	¾ bus.	25 bus.	6·5 in.	Fallowed.
Bobs	,,	20 ,,	,,	,,
Federation	,,	25 ,,	,,	,,
Bunyip	,,	26 ,,	,,	,,
Florence	,,	28 ,,	,,	,,

Second Prize, No. 5152, Smith Pollock, Quirindi.

Variety.	Seed	Yield.	Rainfall	Soil, etc.
Bobs	¾ bus.	34 bus.	8·5 in	Black
Comeback	,,	29 ,,	8·5 ,,	,,
Bunyip	,,	34 ,,	6·34 ,,	,,
Federation	,,	40 ,,	7.63 ,,	Sandy loam.
Rymer	,,	39 ,,	9·28 ,,	,,

Special Prize for the best collection of five non-Farrer Wheats.

No. 5154, Henry Farthing, Tamworth.

Variety.	Seed.	Yield.	Rainfall.	Soil, etc.
Marshall's No. 3	¾ bus.	24 bus	No	Fallowed.
Dart's Imperial	,,	22 ,,	rain	,,
Purple Straw	,,	24 ,,	record	,,
Steinwedel	,,	24 ,,	,,	,,
Manitoba	,,	15 ,,	,,	Autumn ploughing.

RESULTS OF MILLING TESTS.

	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of dry Gluten.	Strength.	Total.
Maximum Marks.	10	15	10	10	15	20	20	100
Catalogue No.				**Class 756 (Macaroni)**				
5087	10	[*63½*] 12	8	[*73·4*] 8	6	[*16·23*] 20	[*52·5*] 20	84
				Class 757 (Hard Red).				
5089	10	[*66*] 15	9	[*72·1*] 10	15	[*13·04*] 17	[*53·6*] 19	95
5091	10	[*65¾*] 15	9	[*70·4*] 8	15	[*10·1*] 14	[*52·5*] 18	89
				Class 758 (Strong White).				
5113	10	[*65½*] 14	9	[*71·3*] 9	15	[*14·2*] 19	[*53·2*] 19	95
5114	9	[*65¼*] 14	9	[*72·7*] 10	15	[*14·3*] 19	[*52·6*] 18	94
5124	9	[*64¾*] 13	9	[*74·0*] 10	15	[*15·8*] 20	[*52·0*] 17	93
5117	10	[*65½*] 14	9	[*71·6*] 9	11	[*13·04*] 18	[*53·0*] 19	90
5100	10	[*65¾*] 14	9	[*72·2*] 10	13	[*12·84*] 18	[*50·0*] 16	90
5115	10	[*66¼*] 15	9	[*71·3*] 9	11	[*10·28*] 15	[*55·2*] 20	89
				Class 759 (Soft).				
5131	10	[*64½*] 13	10	[*71·6*] 9	15	[*10·9*] 17	[*48·0*] 20	94
5132	10	[*65*] 14	10	[*73·0*] 10	15	[*12·3*] 18	[*45·6*] 16	93
5127	10	[*67*] 15	10	[*72·0*] 9	15	[*12·3*] 18	[*44·6*] 15	92
5140	10	[*65*] 14	10	[*71·7*] 9	8	[*14·9*] 20	[*47·8*] 20	91
5142	10	[*65¼*] 15	10	[*72·1*] 9	14	[*9·0*] 16	[*45*] 16	90
5133	10	[*65*] 14	10	[*71·1*] 8	15	[*10·2*] 17	[*44·2*] 14	88
5128	10	[*65*] 14	10	[*71·1*] 8	13	[*9·8*] 17	[*44*] 14	86
5139	9	[*64¼*] 13	10	[*73·7*] 10	14	[*8·3*] 15	[*44*] 14	85
5141	10	[*63¼*] 11	10	[*70·9*] 8	13	[*7·8*] 14	[*43·6*] 14	80

The Teeth of the Horse and its Age.

[Continued from page 53.]

Compiled by the Veterinary Officers of the Stock Branch, under the authority of
S. T. D. SYMONS, M.R.C.V.S., Chief Veterinary Officer.

IN the January, 1912, *Gazette,* notes were given showing the number and positions of the teeth of the horse, and illustrations were published showing the condition of the horse's mouth from birth to the age of sixteen months. The pictures are being reproduced from "Veterinary Notes for Horse Owners," by Captain M. H. Hayes, and "The Exterior of the Horse," by A. Goubaux and G. Barrier.

The present instalment of pictures takes the horse to the age of four years. The delay in issuing the pictures is due partly to the fact that they have to be re-drawn before the blocks can be made, and partly to the space which they occupy.

The last illustration given showed the mouth at sixteen months old, when the milk incisors are level, and those of the upper jaw are in contact with those of the lower.

At twenty months the fifth permanent molars, four in number, are cut, and the colt has thirty-two teeth, eight of which are permanent.

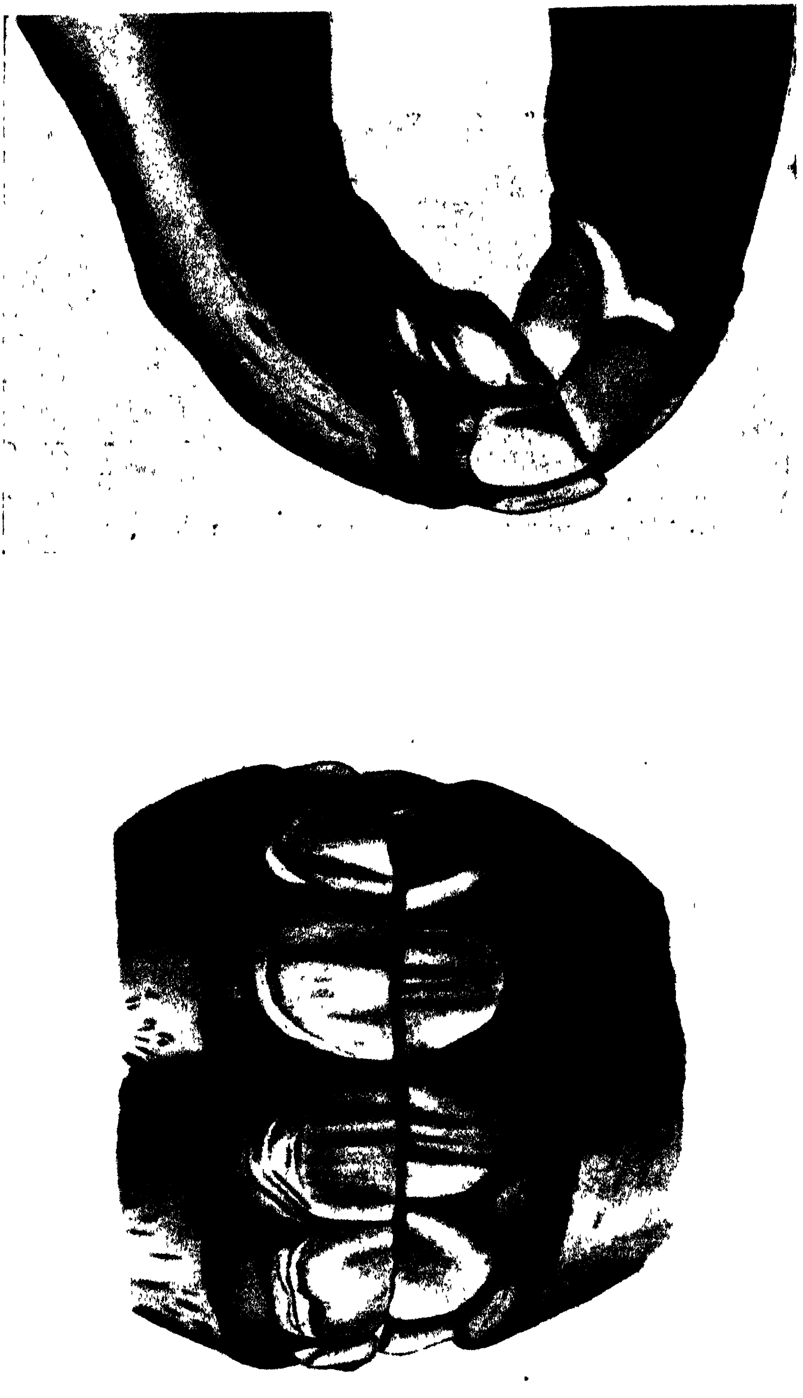
At two years the upper surfaces (or tables) of all the milk incisors are worn, the corner incisors have lost their shell-like appearance, and the fifth permanent molars are well up.

At two and a half years the four central permanent incisors have replaced the corresponding milk teeth, and the first and second permanent molars have replaced their temporary forerunners; thus twelve milk teeth have been shed and replaced by permanent teeth, the colt now having thirty-two teeth, twenty permanent and the balance temporary.

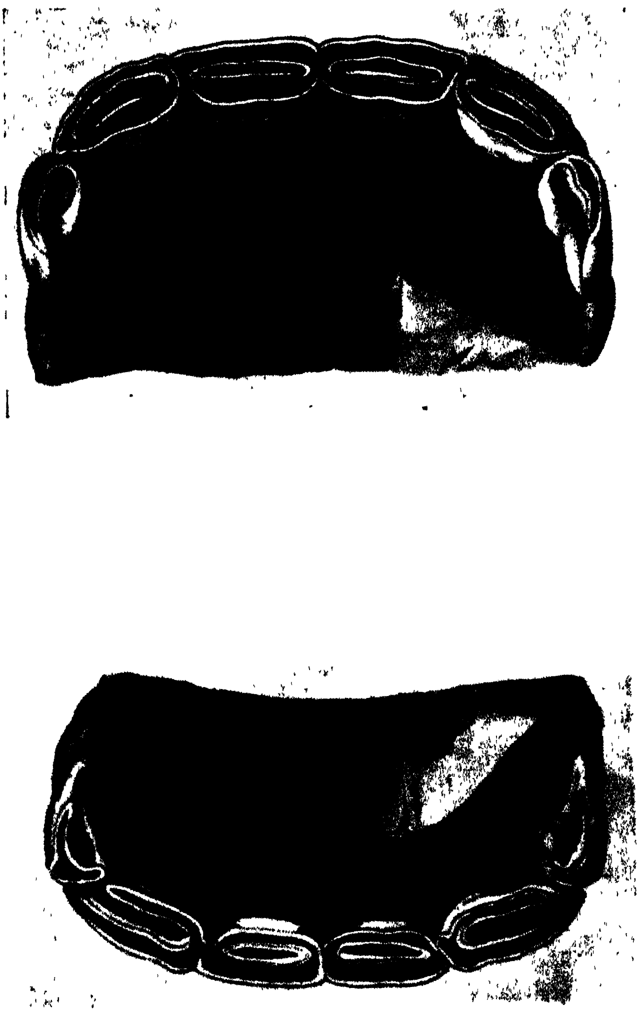
At three years the central permanent incisors are in wear, and the first and second permanent molars are well up.

At three and a half years the four lateral permanent incisors have replaced the corresponding milk teeth, as have the third permanent molars, four in number. The colt now has thirty-two teeth, of which twenty-eight are permanent, eight milk teeth having been shed during the past half-year.

At four years the four lateral permanent incisors are in wear, the sixth permanent molars are up, and sometimes the tushes are breaking through. If the tushes are through, the colt now has forty teeth, *i.e.*, thirty-six permanent and four milk teeth, the latter being the four corner milk incisors.



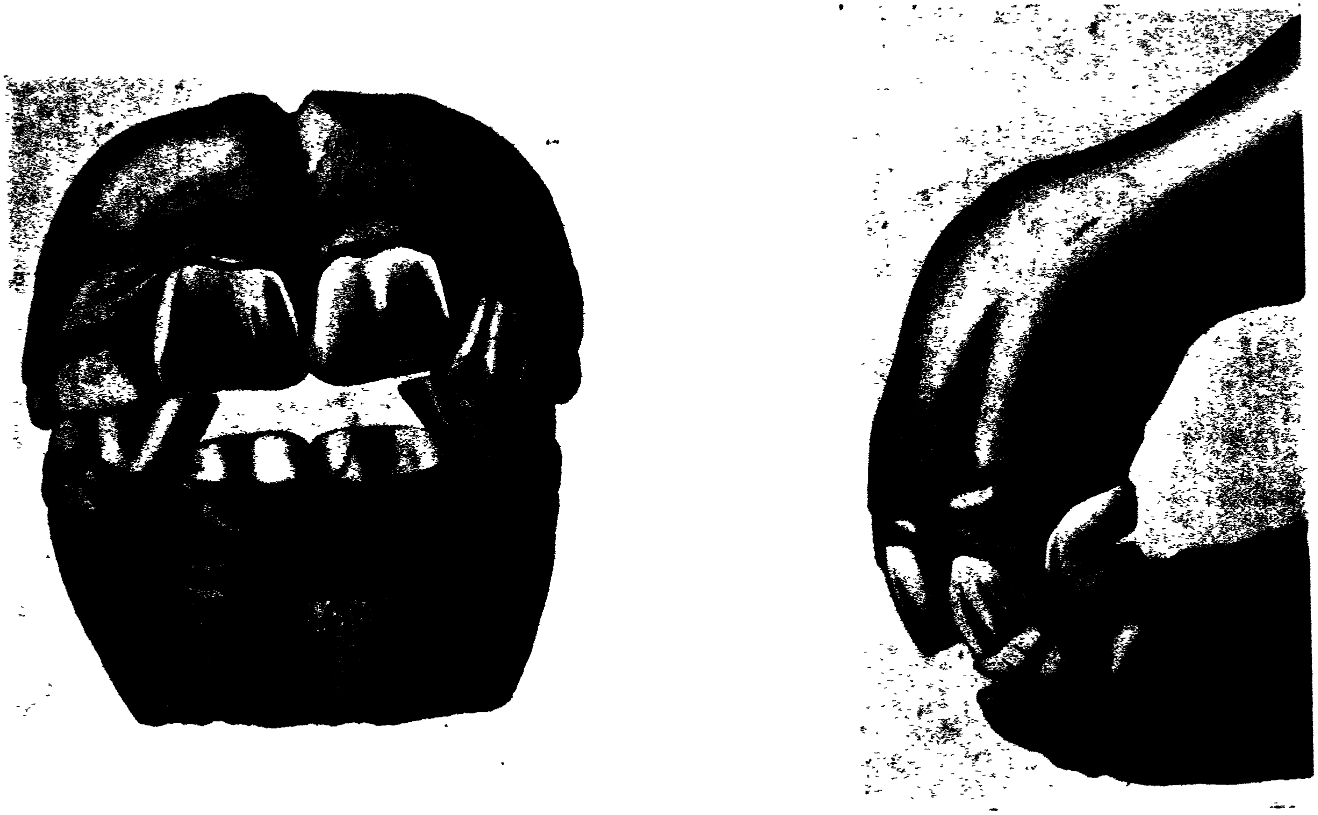
TWO YEARS.



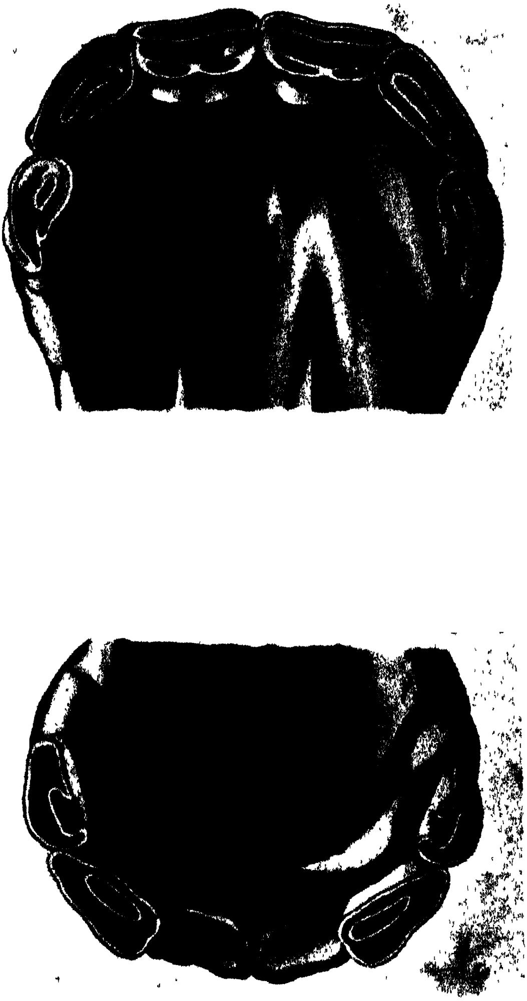
MOUTH AT TWO YEARS.

[*After Goubaux and Barrier.*]

The colt has thirty-two teeth, eight of which are permanent. The tables of all the milk incisors are worn, the corner incisors have lost their shell-like appearance, and the fifth permanent molars are well up.



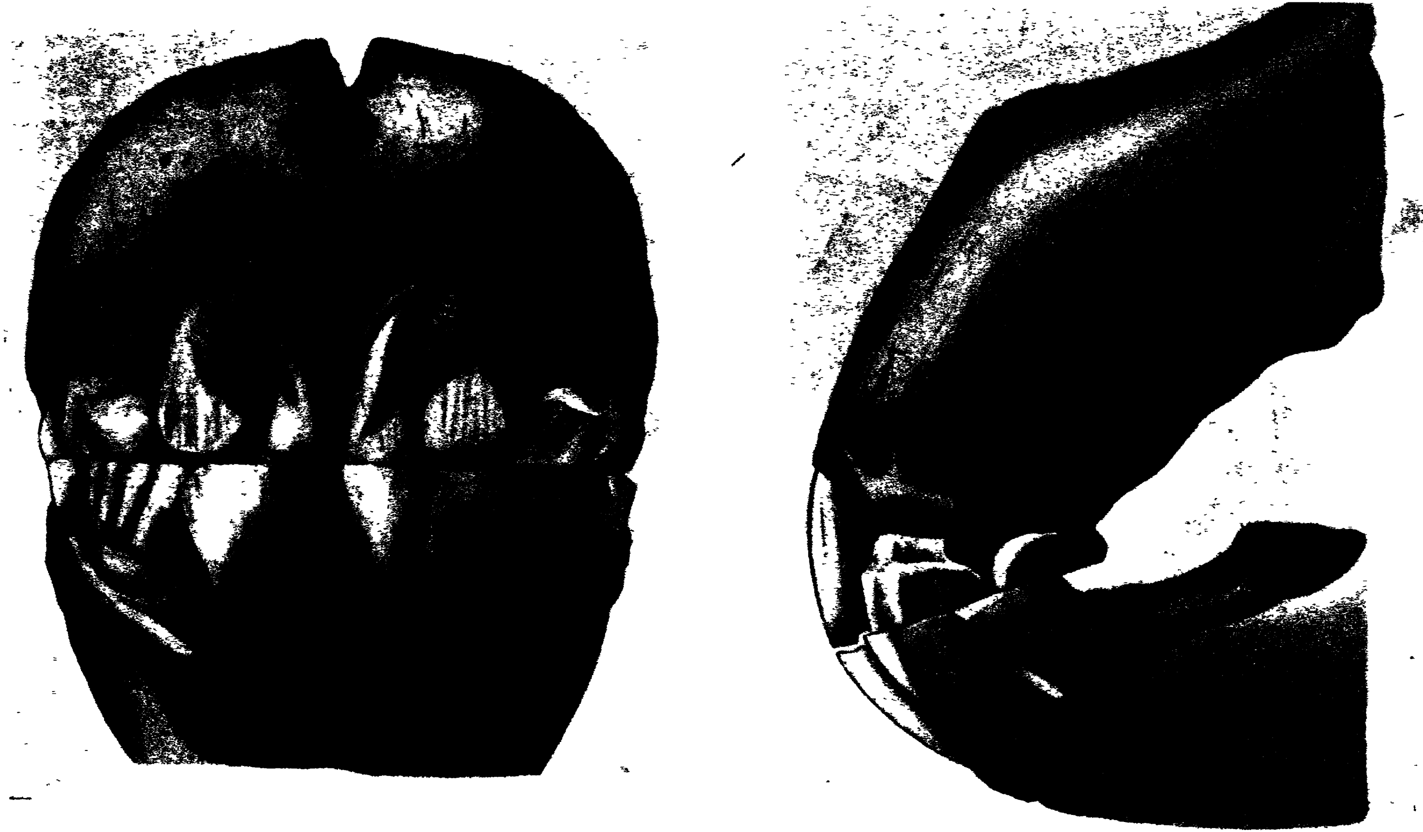
RISING THREE YEARS.



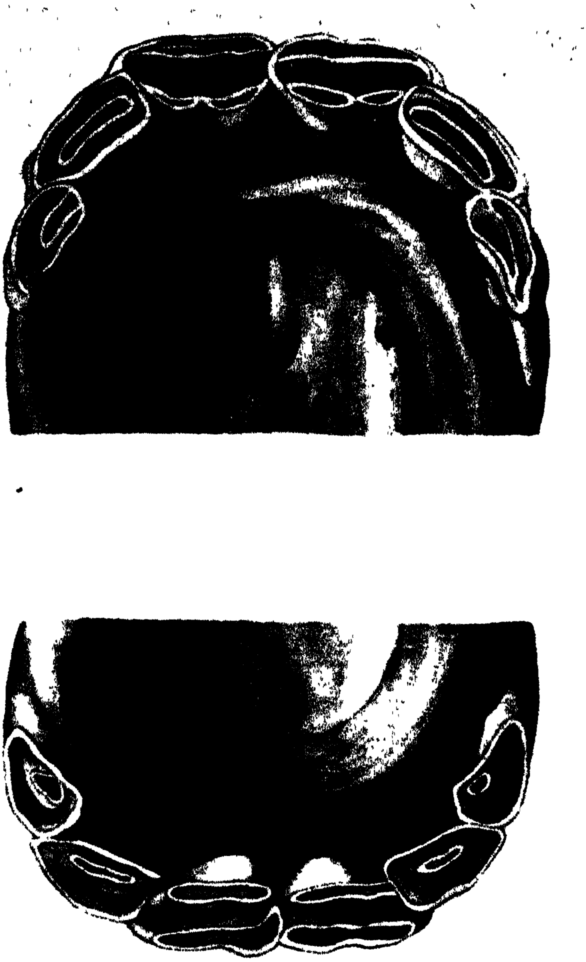
MOUTH RISING THREE YEARS.

[*After Goubaux and Barrier.*]

The four central permanent incisors have replaced the corresponding milk teeth, and the first and second permanent molars have replaced their temporary forerunners.



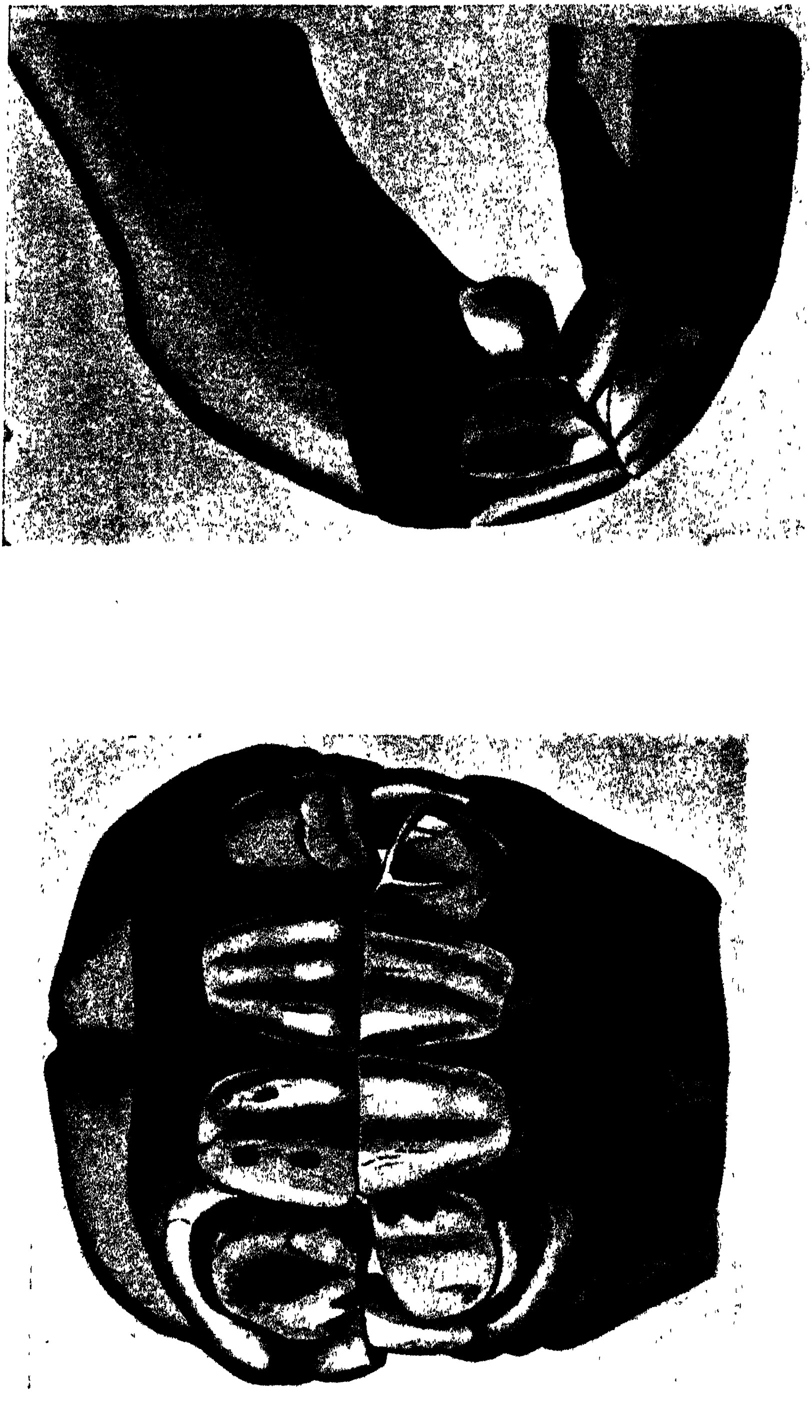
THREE YEARS PAST.



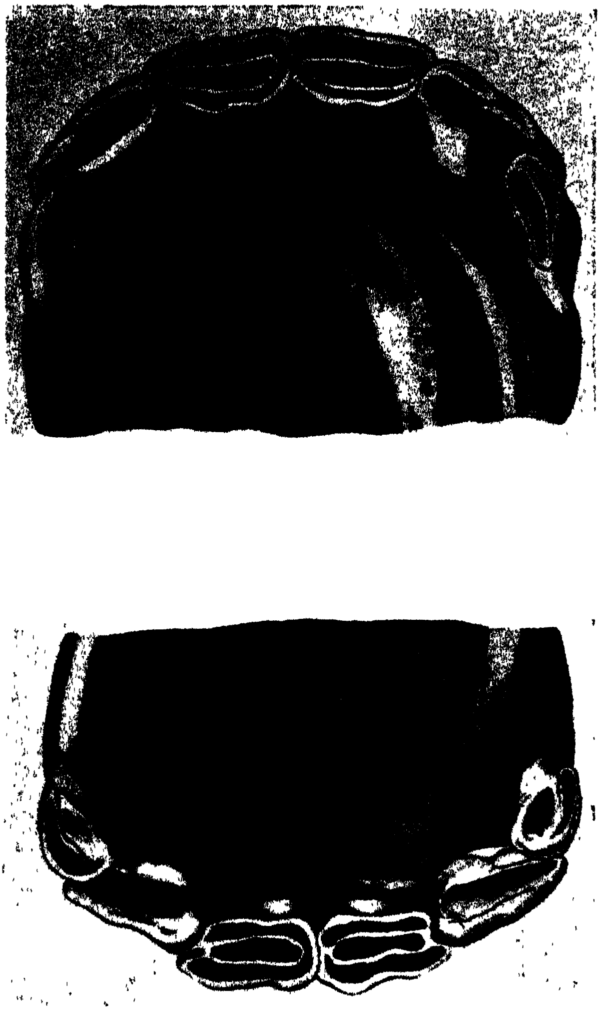
MOUTH THREE YEARS PAST.

[*After Goubaux and Barrier.*]

The central permanent incisors are in wear, and the first and second permanent molars are well up.



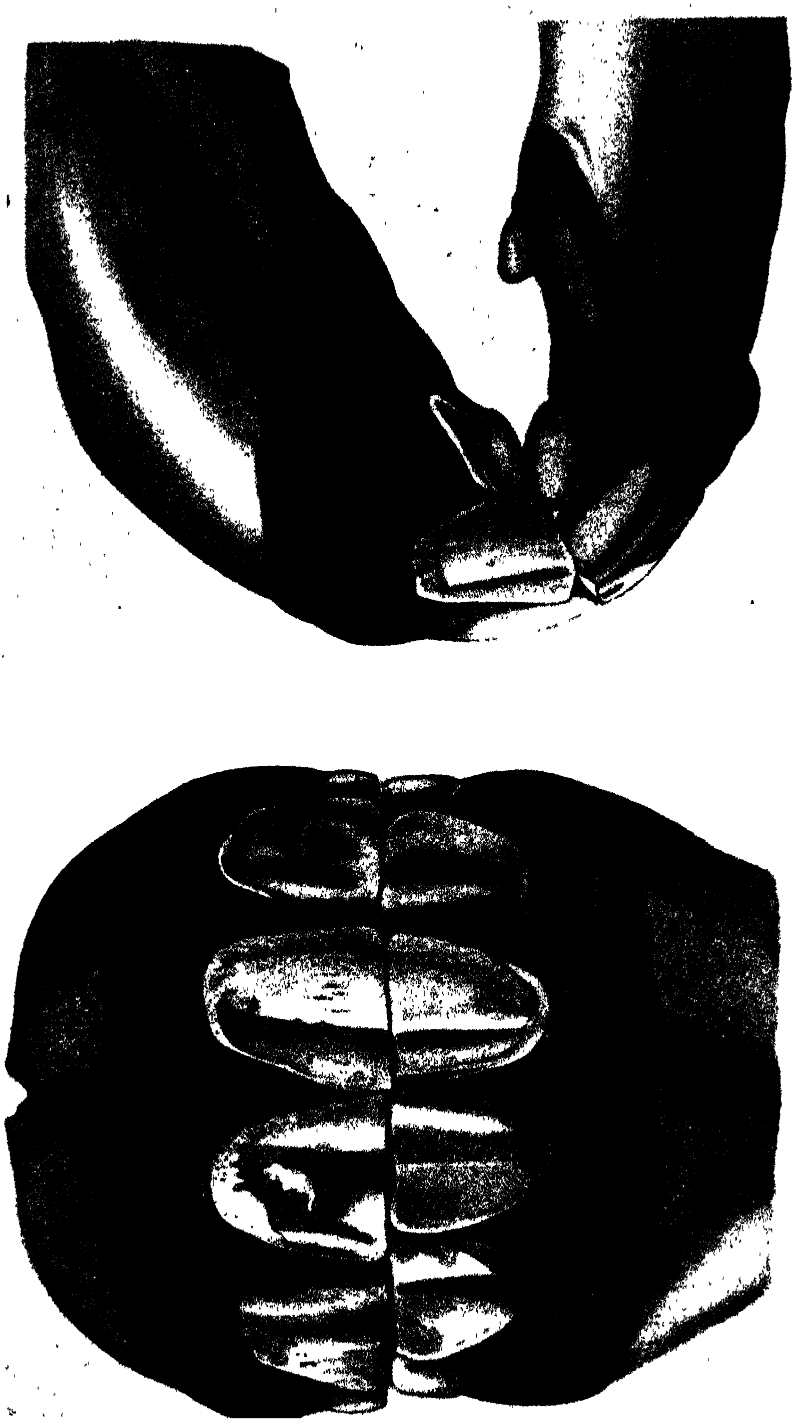
RISING FOUR YEARS.



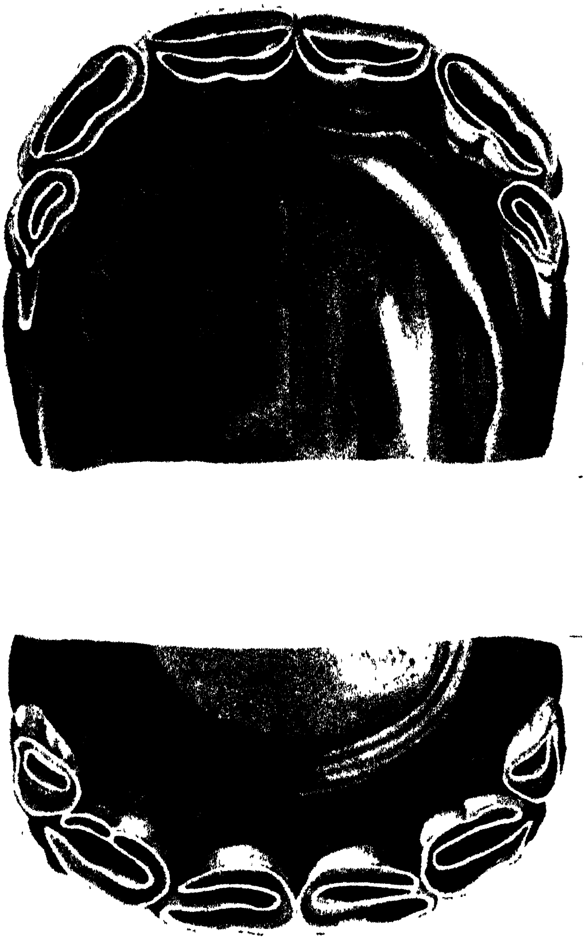
MOUTH RISING FOUR YEARS.

[*After Goubaux and Barrier.*]

The four lateral permanent incisors have replaced the milk teeth, as have the third permanent molars, four in number. The colt has thirty-two teeth, of which twenty eight are permanent.



FOUR YEARS.



MOUTH AT FOUR YEARS.

[*After Goubaux and Barrier.*]

The four lateral permanent incisors are in wear, the sixth permanent molars are up, and sometimes the tushes are breaking through.

(*To be continued.*)

A Fungus affecting Pastures in Manning River District.

G. MARKS, Inspector of Agriculture.

THE bountiful rains that fell last spring were responsible for a luxuriant growth in the pastures of the Northern Rivers. Paspalum, couch, and other grasses, with white clover, were everywhere plentiful, and in many localities it was impossible, even with heavy stocking, to keep the herbage down. Later in the season a fungus disease made its appearance in the Manning and Stewart River districts. It appeared on all classes of grasses and clovers, excepting paspalum, in the form of small circular patches, ranging in diameter from a few inches to a foot or more, distributed here and there throughout the paddocks. As might be supposed, it spread most when showery conditions prevailed.

Specimens were obtained from Mr. F. Longworth's farm at Stewart River, and posted to the Superintendent and Chief Inspector of Agriculture, who had them forwarded to the Bureau of Microbiology for examination. The Bureau reported as follows: –

> The grass is overgrown with a myxomyceite, *Physarum cinereum*. This organism produces a jelly-like, flowing, slowly moving mass, of variable form. It creeps over herbage, ascending the stems, covering them with a brownish layer, in which numerous thin white flakes of chalk are visible. Vast numbers of round violet spores are produced later. As the fungus, in its growth, may do harm to the plants over which it travels, its destruction is desirable; where possible, burning is suggested as the most hopeful remedy. The effects upon stock of eating the fungus are not known with certainty Notes, therefore, of any unusual symptoms shown by stock feeding upon infected fodder would be received with interest.

Nothing has so far been noticed concerning stock grazing in paddocks where this disease has appeared; but as there has been abundance of healthy feed, and the areas affected are small when compared with the total grazing area, it is more than probable that none of the affected pasture has been eaten by stock.

The hot dry weather appears to have completely checked its spreading, but it is quite likely that it will reappear when the next rains set in. This is the first occasion that this trouble has been noticed, at any rate in any quantity, and the foregoing should be of interest to farmers and dairymen in the coastal districts.

Some Faults in Cheese, and Errors in Cheesemaking.

MATTHEW WALLACE, Dairy Branch.*

Two years ago I had the honour of addressing this Association on the subject of Cheese *v.* Buttermaking in Australia, from the farmers' point of view. Since then I have had the opportunity of becoming more intimately acquainted with the cheesemaking industry as it exists in the State.

Where Cheese is made.

The principal centre of cheesemaking is on the South Coast. The comparatively regular rainfall and the cool nights in summer render this district of the State very suitable for the production of cheese. The limited areas of the dairying land in many districts, though unable to support a butter factory of any size, lend themselves to cheesemaking. There are also some important cheese factories in other parts of the State, which, for local reasons and peculiar circumstances, are considered suitable for cheese production.

Unlike buttermaking, the manufacture of cheese is still carried on at many farms where the milk is produced, though the greater bulk of it is made at the factories of private estates and at co-operative cheese factories. In comparing the relative merits of the cheese manufactured, the output of the large private factories stands first. The larger co-operative factories and farms take second place, and the small farms and factories are in many cases a long way behind.

The large private factories are well equipped and managed by cheesemakers of high skill, and the milk, from the cow bail to the cheese-room, is under direct supervison. In the large co-operative factories, though the buildings are generally well equipped, and the managers no less highly skilled, the same oversight cannot be extended to the milk of, perhaps, forty suppliers. In addition, most of these factories are run under contract, a system which, if it has advantages, has certainly disadvantages.

A manager who is paid per pound for the cheese produced, naturally hesitates to reject milk which, in many cases, is too acid for cheesemaking. A further disadvantage is the fact that the whey returned to the suppliers is carted back in the milk cans. In many cases it is scalded by having a steam pipe turned into the whey vat; but, even with this precaution, the faults in flavour of some factory cheese are directly traceable to this practice. I desire here, however, to testify to the high average of general excellence of the cheese produced by some co-operative factories, even under these great handicaps.

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* Paper read before the Dairy Factory Managers' Conference, Sydney, 17th June, 1912.

The secondary quality of the cheese produced at some of the smaller factories and farms is due in a great measure to want of skill and experience on the part of the makers, and the failure on the part of some farmers to recognise that to make good cheese requires both time and skill. It is supposed by some that any farm lad can make cheese of good quality, and at the same time attend to a lot of other duties.

It is no uncommon thing on some farms for a cheesemaker to be required to milk from fifteen to twenty cows night and morning, in which case the cheese generally suffers in quality owing to the process of making being unduly hastened to get ready for the milking. In other cases it is the work of the cheesemaker to feed calves and pigs, and I have known makers leave the cheese at the most critical stage to feed calves while the whey was fresh. However, at some farms where cheesemaking is seriously engaged in, some really first-class cheese is manufactured, rivalling that produced by the best large private factories.

Kinds of Cheese made.

Of the character of the cheese produced, three classes may be mentioned. The first is the comparatively firm, well made, clean-flavoured cheese which is fit to use in from two to three months, but which will keep for six months, or if cured at low temperatures will be a full flavoured, mellow, matured cheese in twelve months. This class of cheese is to be found on the counters of high class grocers, at the clubs, and at first-class hotels.

The second class is a softer cheese of mild flavour, which is fit for use in from four to six weeks, but which is not a long-keeping cheese. This is the cheese most favoured in mining districts.

The third class is generally that which want of skill, ignorance, bad management, or unclean milk makes it. Its definite quality one never can tell; the only thing which can be predicted with any degree of certainty is that it may possess all or any of the faults peculiar to a really poor cheese. Its final destination is usually the counter luncheon or some obscure country store.

Rough Cheese.

The principal faults in cheese, as placed on the market, are contained in what is known as "Rough Cheese" This denotes a general carelessness in the manufacture and get-up of the cheese, reflected in the finished article by badly fitting bandages, rough ends, crooked shapes, and broken rinds. This class of cheese may be not altogether bad, but the quality is always irregular-good to really inferior cheese being met with in the same consignment. The sales of this product are disappointing to both producer and agent. Satisfaction is even denied to the consumer.

Hard Acid Cheese.

This kind of cheese is frequently met with, especially during the summer months—the principal cause being too much acid developed in the curd before removing the whey. One of the initial causes is the failure to cool (or sufficiently cool) the milk used for making the cheese.

This fault is intensified in the finished product, if cured at a high temperature, the loss of fat assisting to make the cheese dry and crumbly.

Soft Acid Cheese.

This is also the result of over-development of acidity, but the fault lies chiefly in the production of too much acid in the milk before renneting. Here the development of acidity outstrips the process of manipulation, the product being an imperfectly cooked curd, too acid, and containing too much moisture. This cheese will not keep for any length of time, and develops a strong flavour and taste unless kept in a cool room.

Soft Bitter Cheese.

This is due chiefly to an error in manufacture, too little acid being developed before the whey is removed from the curd. This cheese is usually met with in cold weather, but may also be the result of a hurried process of manufacture. If put in a curing-room at ordinary temperatures it will puff at the ends, and generally loses shape by taking a list to one side.

When cut it has usually a bitter taste, and the cheese is of a leathery nature, containing many round holes. A fruity flavour sometimes develops in this class of cheese, unless made from very clean milk.

Cheese with Cracked or Open Rinds.

This fault is most frequently met with in winter time, and may be due to various causes. It may be the result of insufficient pressure, or putting the curd to press at a low temperature.

A tender curd when put to press will often exude fat, thereby preventing the particles of curd from uniting properly. This defect in cheese is often accompanied by a growth of mould in the cracks, causing considerable waste when the cheese is cut. A high acid cheese may also show cracks in the rind.

Disagreeable Flavour.

A cause of complaint in some otherwise good cheese is the presence of a very disagreeable flavour when cut. This often happens with a cheese in which at the time of making no taint is apparent, but the cause is directly or indirectly due to contamination of the milk. The fault is difficult to trace to its source, as the cheese is frequently several months old before being cut. While there is no doubt as to the bacterial origin of the trouble, it would appear that it is the after result of some previous fermentation, as it is rarely if ever met with in new cheese, and does not fully develop until after the cheese is cut.

Other Considerations.

The greater quantity of the inferior cheese is due to causes already mentioned, but much good could be accomplished and a great deal of money saved if greater care was exercised in the handling of the milk. It should also be cooled as soon as possible after being drawn from the cow. Cooling at once to moderate temperatures is infinitely better than cooling to lower temperatures some hours after milking. Cooling to a low temperature later may keep the milk from becoming sour, but no known process can ever eliminate the fermentative products already formed in the milk.

Greater care is also necessary in the curing of the cheese. It would be an interesting calculation to estimate how much is lost to the cheesemakers of New South Wales by the storing of cheese in improper curing rooms.

It is a common thing to find cheese-rooms of single weatherboard walls where, in hot weather, the temperature may reach 90° Fah., and where the fat may be seen dripping from the cheese on to the floor. Apart from the loss in weight, great damage is done to the quality of the cheese. The best cheese that can be made is easily spoiled by overheating. Insulation of some kind is absolutely necessary in a cheese-curing room.

A present feature of the cheese trade is the relatively high price realised for low grade cheese compared with the special brands. This is unfortunate, and leads many people to imagine that they make a better class article than they do. There are cheeses on the market which bring within ½d. or 1d. per lb. of the best cheese, when, in reality, there is a difference of from 2d. to 3d. per lb. in their true values. This state of affairs cannot continue indefinitely, and the sooner some makers realise it, the better it will be for themselves. It cannot be expected that, in periods of heavy market supplies, agents will be able to dispose of second grade cheese at prices almost equalling first rate quality.

It is a feature of cheesemaking that the less competent a maker is in his work, the more reluctant is he in many cases to accept advice. Highly skilled makers of long experience are ready at all times to discuss phases of the work which present difficulties, and there is a general recognition of the fact that in cheesemaking there is ever present the unknown factor which may upset all our calculations. It is this recognition on their part, and constant vigilance in the daily routine, which in the end makes for success.

EGG-LAYING COMPETITION AT GRAFTON.

THE Minister of Agriculture, Hon. J. L. Treflé, M.L.A., has been advised by the Manager of the Grafton Experiment Farm that the Egg-laying Competition, which commenced at that institution on the 1st July, 1912, has started with a full complement of pens. The total number of competitors is twenty five, and, in addition, the Farm itself has a non-competitive pen of six birds, consisting of Farm-bred Leghorns, which are being tried for the purpose of comparison.

The competing breeds consist of the following:—

20 pens White Leghorns.
1 pen Brown ,,
1 ,, Black Orpingtons.
2 pens Silver Wyandottes.
1 pen Minorcas.

Comparative Merits of Lucerne Hay and Maize Silage.

[From *Hoard's Dairyman*, 24th May, 1912.]

HOARD'S DAIRYMAN.—At a recent meeting of the Southern Wisconsin Dairymen's Association, one of the papers on the programme brought out a discussion as to the comparative merits of alfalfa* and the silo for the dairyman. The exciting cause of this discussion was a talk on the merits of the silo, by a representative of the Wisconsin Agricultural College. It was a very thorough and able presentation of the subject, but the fact that this was given largely to a community of farmers who take their milk to Swiss cheese factories and who are becoming very extensive growers of alfalfa, made the subject of particular interest. The writer of this article could have considerable to say about the advisability of the extensive use of the silos in Swiss cheese communities, but he wants to discuss the comparative merits of silage and alfalfa for feeding dairy cows in communities where alfalfa grows unusually well and where corn produces an average crop.

There are a few facts which can be used in a discussion of this subject. Land which will produce 10 tons of corn silage will produce 3 tons of alfalfa hay to the acre. Land which will produce 12 tons of silage to an acre will produce about 4 tons of hay to the same area. The ordinary cow will eat about 60 lb. of silage a day; the same cow will eat about 20 lb. of alfalfa hay a day. According to these figures, 4 tons of alfalfa hay will feed a cow the same length of time that the 12 tons of silage will, and an acre of alfalfa will feed a cow as long as an acre of silage. Figuring interest on the value of land as $8.00, and allowing $2 per ton for putting up alfalfa hay, which is a very liberal allowance, it costs $16 to produce an acre of alfalfa hay. An acre of silage producing 12 tons costs more than $16, probably being nearer $24 or $25. Alfalfa is not so hard on the soil as the corn; in fact, land can be continually cropped to alfalfa and with the addition of a little phosphate rock become constantly more fertile.

Cows fed upon an alfalfa ration do not require so much grain for a maximum production of milk as cows fed on corn silage. A grain ration of 6 lb. corn meal per day is about all a cow, in the heaviest flow of milk, will make use of when fed with alfalfa hay. When feeding silage, it takes a grain ration of 8 lb. to 10 lb. for a maximum feed, and this grain ration fed with the silage is more expensive, as it must generally be purchased in the form of concentrated protein-bearing material.

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* The American name for lucerne.

Again, it has been demonstrated that alfalfa hay with a grain mixture of corn meal will produce more milk with the exception of cowpea silage, than any other single rough forage combined with any practical grain ration that can be suggested.

The advocates of silage have maintained that a cow requires some succulent food for her best work. It is not known just why this is claimed unless it is the fact that cows are known to do their best when feeding on good pasture. The claim that cows are healthier when having a succulent food is almost wholly theory and not well founded at that. The writer has talked with one of the very greatest authorities on feeding problems on this point, and he said the only reason for claiming that a succulent food was desirable for feeding any animal was that of palatability and possibly as an appetiser. The writer will leave the question, whether a succulent food is needed to increase the appetite of a cow fed on alfalfa hay, to anyone who has ever had any experience in feeding this forage crop Alfalfa hay has, too, practically the same physiological effect on an animal as is claimed for corn silage. The writer has combined the two, corn silage and alfalfa hay, under experimental conditions, and confesses to his absolute inability to see any advantage whatever in using the silage. In fact, where the silage was used as a part of the ration, the milk-flow dropped off.

There are perhaps many cases where it would be economical to use the silo. It is well understood, of course, that in the States east of the Mississippi, a rotation of crops must be followed, as the alfalfa is quickly run out by blue grass, and it is better to put this land in corn for a year or two to subdue the blue grass. In such a case it is probably found desirable to handle the corn crop through the silo, but this is not an argument against the proposition that the land would have been more profitable in every way if a crop of alfalfa rather than a crop of corn could have been produced upon it. In such a case the silo is forced upon a man, not because silage is better for the cows, and will produce more milk, but because the land cannot be made to produce alfalfa without the intervention of the corn crop.—C. F. DOANE, Pennsylvania.

Comments by "Hoard's Dairyman."

In discussing the above subject there seems little to be gained, except a friendly debate between Mr. Doane and the editors of this paper. To a certain extent, it is like discussing which is the most important, air or water. The plants are so different in composition and physical properties that they are scarcely comparable in any way. If we ignore the combining effects of feeds and the balanced ration, we may then find some ground for discussing the relative feeding value of alfalfa hay and corn silage.

Experiment stations have not given us an abundance of data on the effects of combining feeds, or why two feeds of the same chemical composition and chemical make-up may *not* complement some other feed equally well. Recent experiments conducted by the Wisconsin station, indicate that we have comparatively little knowledge on the physiological effect of feeds on animal development in all its different phases; but, as a general practice, we know it is unwise to feed one kind of plant to an animal, except fresh grass. We might add, that even with grass some dry roughage is beneficial. Because alfalfa hay and grain have been better milk producers than silage and grain, does not prove alfalfa superior to corn silage. Corn is a fairly good hog feed, but when fed continuously the hog degenerates ; it becomes small in bone and its breeding powers impaired.

Skim-milk, without question, is one of our best hog feeds, but when fed alone it is unsatisfactory. Experiments have shown us that the best results are to be obtained by feeding 1 lb. of corn to 3 lb. of milk. The greatest and most economical gains are made when these two feeds are fed in this proportion. Tankage and corn produce larger and more economical gains than corn alone, and so do soybean meal and corn produce better results than corn. Here we have striking examples of the value of combining different feeds.

If a cow be fed 20 lb. of alfalfa hay a day, she is supplied with far more protein than is necessary for producing a reasonably good flow of milk, and is not furnished sufficient carbohydrates. Corn silage, on the other hand, does not furnish sufficient protein or carbohydrates for doing profitable work Combining the two feeds, giving 15 lb. alfalfa and 40 lb. of corn silage daily, supplies a ration without any grain that will produce 25 lb. to 30 lb. of milk. Moreover, we know that this kind of ration will not only produce milk but will keep the animal strong and vigorous, and produce strong calves

We have not sufficient data to warrant us to make any statements regarding what effect alfalfa would have upon the future development of animals if no other feed were fed with it. This might be said of most all feeds, for a great many of our feeding experiments have not been conducted for long enough periods to determine exactly what effect a certain system of feeding would have upon animals if continued for long periods.

We know the effects of grass, for cattle have subsisted upon this for many generations. And we also know that when cattle are running on grass they do splendid work. This is one of the reasons that have led those favouring silage to make the statement that cows require succulent feed, but there are other things also that indicate strongly the importance of succulence in every ration. Cows receiving succulent feed will consume more feed and with greater safety than those fed entirely upon a dry ration. Dairymen who have made large advanced registry records have found this to be true : and it is safe to say, that in the case of every large record ever made, the ration has contained silage or roots, or succulence in some form.

Mr. Doane admits that succulent feed is more palatable. The very fact that it is more palatable is another reason for feeding silage. In the book entitled, "The Work of the Digestive Glands," written by Professor J. P. Pawlow, and translated into English by Professor W. H. Thompson, we find in substance the following statement

> The experiences of daily life teach us from the outset that the activity of the salivary glands begins even before the introduction of food into the mouth One acquires the impression that everything brought into the mouth may reflexly influence these glands,

the only difference being a gradual shading off in the effect, depending on the strength of the stimulation which the substance introduced is able to exert. The foods that are palatable exert a favourable influence upon the digestive organs and stimulate them to do their best work.

In the course of a year we receive many letters from the western part of the country where alfalfa is used exclusively for feeding animals. It is not uncommon for them to state that the animals have more or less trouble with their digestive organs. Some feeders have arranged for cutting a portion of the alfalfa and steaming or soaking it in water, claiming that this process improves the feeding value of alfalfa and makes the animals less susceptible to derangements of the digestive organs. While we are very partial in regard to alfalfa hay, and believe in its wonderful feeding value, yet we are not ready to accept the statement that it is better than corn silage. We believe that by combining these two plants which complement each other so well, we will obtain greater returns than if either were fed alone.

TUMUT MAIZE AND WEEVILS.

IN October, 1911, *Gazette*, page 911, results were given of some observations made by Mr. W. W. Froggatt, Government Entomologist, respecting the immunity from infestation by weevils, claimed for maize grown at Tumut. In order to obtain further information upon the matter, four samples of maize grown at Tumut (Yellow Dent, Early Clarence, Golden Grain, and a cross between Golden Grain and Early Clarence—all said to be highly resistant to weevil) were planted at Grafton Experiment Farm in November, 1911. When harvested in May, 1912, all the varieties were found to be badly attacked by weevils.

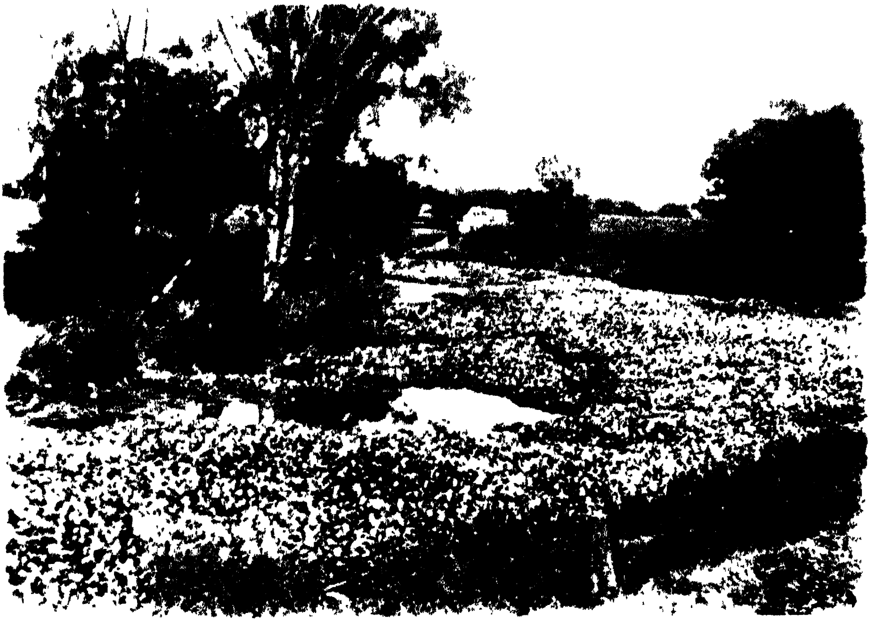
The samples of maize from Tumut, Grafton, and Maitland, referred to in the October *Gazette*, have now been kept in stoppered jars by the Entomologist for two years. Mr. Froggatt reports:—

All the samples from Tumut, and two from Mr Bowden, of West Maitland (Golden Drop and Golden Yellow), are as hard and smooth as when received All the other samples are decayed and rotten, through the action of the weevils that have fed upon and died among the grain. That these samples were infested by weevil eggs before they were received by us is quite evident, as no weevils could enter the jars. That the two samples from Maitland, and those from Tumut, were not weevil-infested when received is also evident.

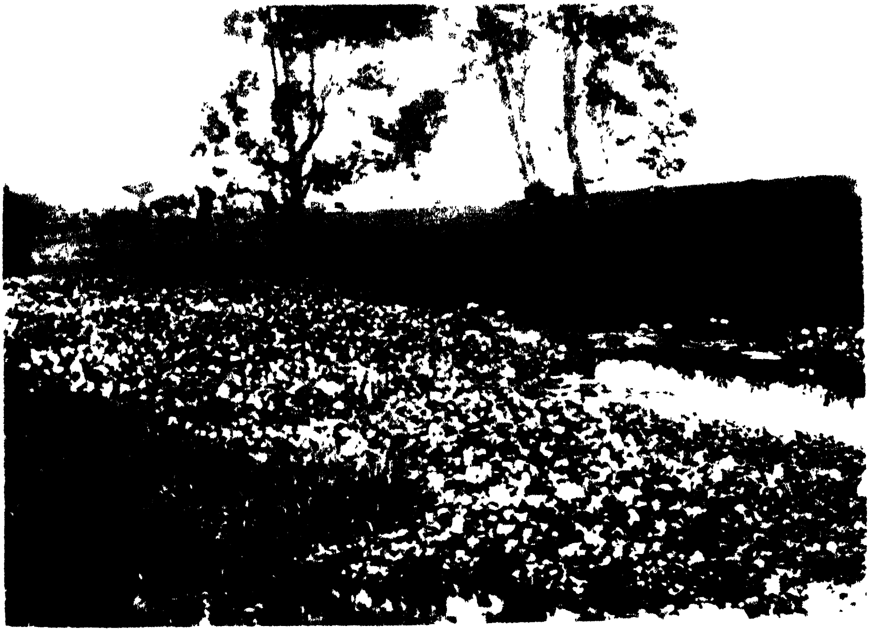
To prove this, one jar of clean Tumut maize was opened and a number of live weevils placed among the contents. This sample is now in the same decayed and rotten condition as the northern samples. A bag of Tumut maize that was left on the floor of the room during the course of the year became so badly infested with weevils that had emerged from other samples in the office that it had to be destroyed.

This shows that the Tumut maize is not infested when harvested, but that if it is placed in weevil-infested quarters it is just as easily infested as any other kinds, and is certainly not immune, as has sometimes been stated. Sent in clean bags direct from the farm it would be clean, while much of the northern grown maize is infested in the field before it is harvested.

Clean farming, and the destruction by burning or fumigation of all waste cobs, maize, and rubbish in the sheds and about the paddocks, would make a great difference in the weevils about the northern farms.

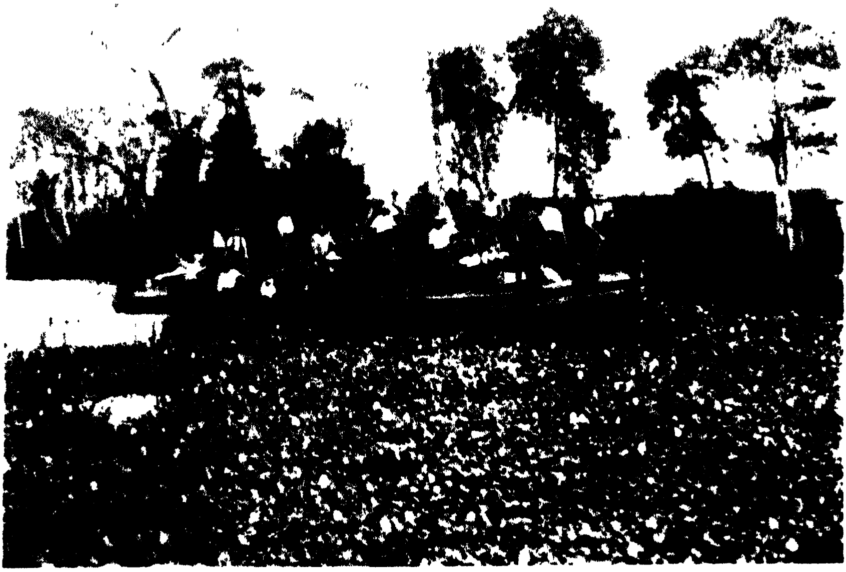


Sandy Creek, showing Water Hyacinth from bank to bank.

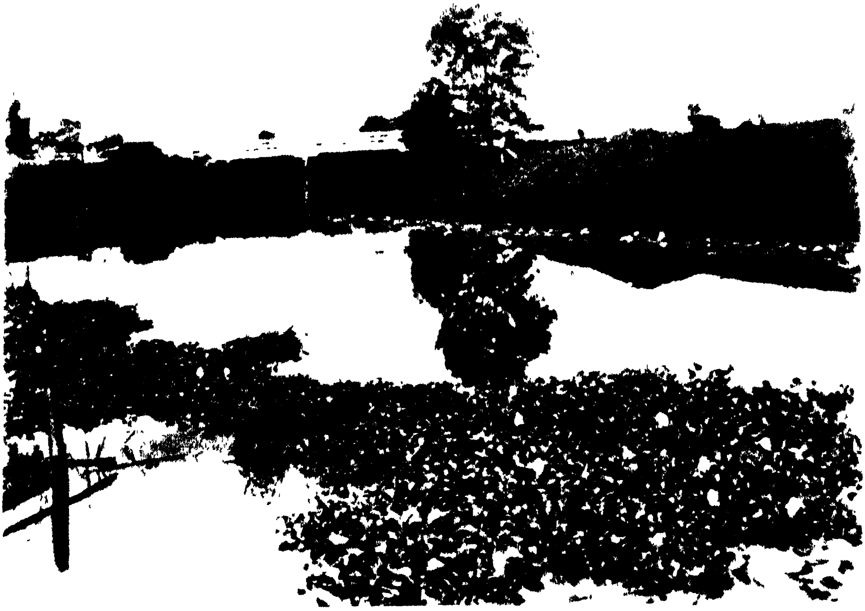


Sandy Creek, 2 miles above junction with Bungawalbyn Creek. Droghers used to go 3 miles above this spot.

THE WATER HYACINTH.



Settlers clearing Water Hyacinth from Sandy Creek.



Sandy Creek after treatment. See pile of Hyacinth on right bank.

THE WATER HYACINTH

The Water Hyacinth.

LOCAL ACTION AT SANDY CREEK.

THE water hyacinth has become such a serious pest in the northern rivers that the Progress Association at Coraki has determined to tackle the problem for itself, and is confident that the success of its labours will justify the Government in giving it a grant of £ for £. Sandy Creek, which runs into Bungawalbyn Creek, which in its turn finds its way into the Richmond River, was completely choked up in some parts, and the outlook for the steamer trade in timber and in cream-cans was very serious. The local residents subscribed £70 themselves, and they have already cleared the river for a distance of 2½ miles, removing 50 tons of the weed on to the high banks, where it will rot.

The photographs show how completely Sandy Creek was blocked with this weed from bank to bank, and also the method adopted for dealing with it. Another shows the creek after some treatment, with an enormous pile of hyacinth on the bank. The Bungawalbyn Creek is being rapidly choked up and infected from Sandy Creek.

Application has been made to the Minister of Agriculture for a subsidy of £ for £ in aid of the work. This is the mode of action proposed to be adopted by the Bill now before Parliament

SPRAYING TO KILL WEEDS.

THE Ohio Experiment Station is making experiments in this direction with several sprays (Circular No. 102). The most promising are common salt (3 lb. to 1 gallon of water); iron sulphate (1¾ to 2 lb. to the gallon); calcium chloride (same strength as salt); sodium arsenite (1½ lb. in 50 gallons); and copper sulphate (8 to 10 lb. to 50 gallons). These solutions are used at rates from 40 to 75 gallons per acre. The chemicals are all comparatively cheap. Salt has proved the best spray for Canada thistles, poison ivy, yarrow, and horse-nettles. Iron sulphate kills mustard weed, ragweed, white-top, yarrow, and other weeds.

The Station Botanist points out that these chemicals kill plants of the broad-leaved class (thistles, dandelion, carrot, nettles, &c.), but do no injury to narrow-leaved plants (such as grasses and cereals). It follows that crops like clover, lucerne, vetches, or rape will be killed by the chemicals; and also that weed grasses, black oats, and other narrow-leaved weeds will escape. It would therefore be wrong to spray a lucerne paddock to destroy prairie grass - you would kill the lucerne and leave the prairie. But the whole thing is in the experiment stage as yet.

Mixed Farming at Inverell.

J. E. O'GRADY.

A DISTRICT with an average annual rainfall of 32 inches, so distributed that the heaviest falls occur in the summer, when the evaporation is greatest; a district so elevated that the extreme heat of Australian summers is seldom or never reached, yet lying so far to the north that snow rarely falls; a district of rolling uplands, with excellent water catchment, yet so free from breaks that furrows a mile in length are not unknown; a district where almost every plant and every domestic animal raised in Australia thrive to perfection—such is Inverell. But it is 509 miles by rail from Sydney, by the circuitous route through Moree, and 105 miles from the nearest port at Newcastle; whilst the cross-country road to Glen Innes, though shortening the journey by 42 miles, is itself so long and hilly as to be out of the question for the conveyance of bulky produce. Farmers are eagerly looking forward to the proposed direct rail to the coast, and meanwhile they are producing whatever they can sell.

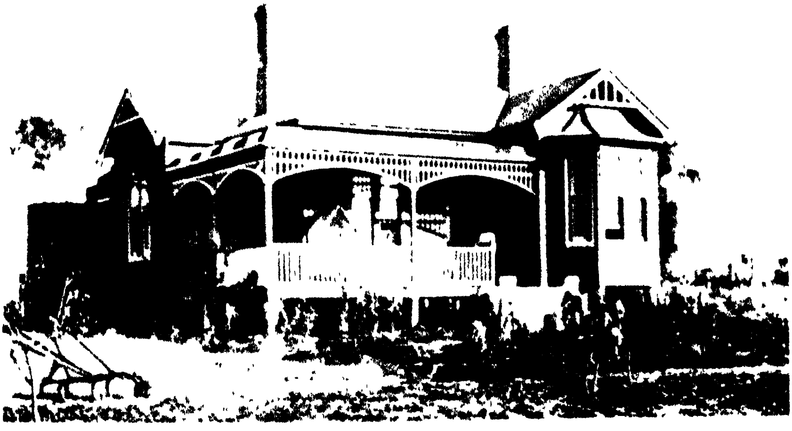
It is felt that it will be of interest to place on record the present practices of several of the successful farmers in this beautiful district, to give some preliminary ideas to those who will take up farming about Inverell when the inevitable railway is opened, and to afford a basis for comparison with the methods adopted in other localities with somewhat similar conditions. For introduction to these gentlemen I am indebted to Mr. J. Ditzell, "Lansdowne," Inverell.

NULLAMANNA.

Nullamanna lies on the Emmaville-road, 11 or 12 miles from Inverell. It is surrounded by a free, red basalt soil, differing from the adhesive black soil which forms a large proportion of the country about Inverell. The township consists mainly of a store; but the general appearance of the homesteads on the red soil hereabouts is proof enough that the Nullamanna farmers are prosperous. One of them is Mr. E. Pietsch, of "Glencoe," who very kindly gave me some notes of his experience.

Mr. Pietsch was one of a family of ten, reared on a farm of 25 acres near Castlemaine, Victoria. At an early age he was attracted to the goldfields of Queensland. In 1872, when the prospects of Glen Innes were being highly commended, he took up a selection of 100 acres in that district, with a capital of £80. He subsequently increased his holding to 308 acres, but the soil was black clay, seed was dear, and returns low for many years, so seven years ago he sold out and obtained his present farm, then in an undeveloped and neglected condition, at a comparatively low price. As he is now advancing in years, the practical assistance of his sons is of great

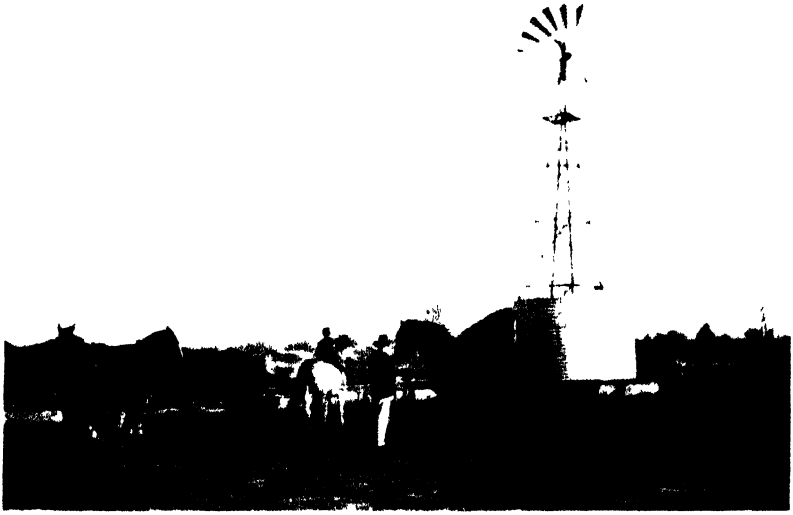
The old homestead at Glencoe Farm, Nullamanna.



The new homestead, Mr. E. Pietsch's Glencoe Farm, Nullamanna.

The house brought from Sydney. Total cost, material's freight and erection, about £[illegible]

MIXED FARMING AT INVERELL.

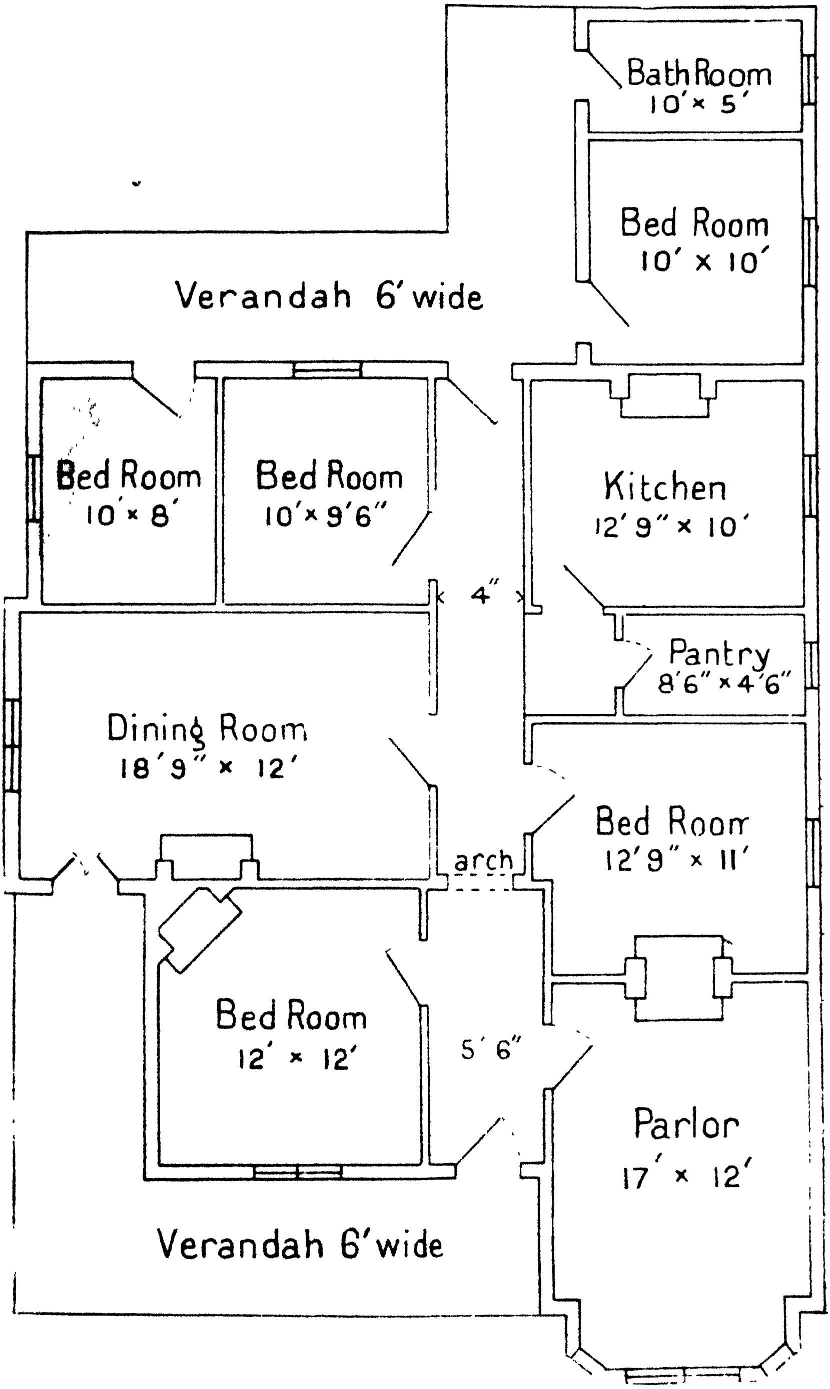


Watering horses, Glencoe Farm, Nullamanna.

A hayshed on Glencoe Farm, Nullamanna.

Lucerne hay on the left; wheaten hay from frosted crop, 1910, on the right.

MIXED FARMING AT INVERELL.



Ground plan of Mr. E. Pietsch's residence, Glencoe Farm, Nullamanna, Inverell.

service to him. The old homestead has been replaced by a substantial and commodious residence, a large portion of the farm has been cleared and broken up, and mixed farming has changed the property into a very valuable one.

Glencoe Farm comprises 1,154 acres, of which about 500 are cultivated. From 100 to 130 acres of wheat are grown each year, 100 acres of oats, 100 acres of maize, and there is a lucerne paddock of 100 acres. A small area is used for growing fodder for cattle, and the rest is fallowed.

The clearing cost from £1 to £3 per acre, the timbers being chiefly box, gum, and apple. More land is to be cleared and cultivated

The stock include 28 to 30 horses, 40 milch cows, 25 to 40 pigs, 500 sheep, and about 200 head of poultry.

Dairying.

Mr. Pietsch regards this as the safest and most profitable branch of his operations. He recently sold a large herd of cattle, and has started again with 40 heifers. These are of good milking quality, chiefly grade Ayrshires, but the most suitable breed for the district does not appear to be settled yet. Ayrshire, Shorthorn, Guernsey, and other breeds may be seen about Inverell, and apparently they are all giving satisfaction.

A three horse-power steam engine, a set of milking-machines, and a steam turbine separator, enable the drudgery of dairying to be overcome; cleanliness, the backbone of the industry, being secured without much labour. The machines have had no injurious effect upon the cattle, as every precaution is taken to keep the parts clean, and the use of the steam jet for cleansing utensils is in striking contrast to the old style of hot water and "elbow-grease."

Mr. Pietsch has no apprehension of a shortage of feed for his cows during the present winter, for the simple reason that he has, amongst other fodder reserves, a shed full of lucerne hay, which he says is "the best asset a man can have on a farm." The Nullamanna soil is not "lucerne ground" in the sense in which the term is understood on the Hunter and the Peel, but the red soils grow very good crops when the season is suitable. This year, on account of the long dry spell, there have been no cuts for hay, the hay shown in the illustration was produced in the previous season. The cattle are grazed on the lucerne paddock, but great care has to be taken to prevent losses of stock from "bloat."

On the Arrawatta estate, under the direction of Mr. H. R. Alexander, formerly manager of Wollongbar Experiment Farm, fourteen silos have been erected, but they appear to be the only ones in the district as yet. They have excited a great deal of interest, and farmers are watching the work. Some hold the opinion that hay affords a simpler and less expensive method of tiding over a dry spell—which is not a very common occurrence in the Inverell district—while others consider that the succulent form in which fodder is conserved as silage, makes the method one which should be generally adopted. At any rate, the farmers are fortunate in having this demonstration in their midst, and time and observation will settle the question of the merits and demerits of the silo for the conditions.

For water-supply, Mr. Pietsch has three dams and two wells, but his farm has also about 30 chains frontage to Fraser's Creek. The dams are about 1,000 yards each. The wells are 81 and 40 feet deep respectively, the deeper one, near the house, being fitted with a windmill and troughs for watering stock. There had been only 8 inches of rain since Christmas, but there was plenty of water at the end of May, so the provision made may be regarded as ample for a farm of that size.

The pigs are, of course, fed on the by-products of the dairy, and pie-melons are grown for them. When maize is cheap it is used for fattening pigs, but not whilst the prices are as high as they have been lately.

There is a bacon factory attached to the Inverell butter factory. The price being paid for bacon pigs, 90 lb. weight and upwards, was 3d. per lb.; below 90 lb., 2½d.

Mr. Pietsch points out that if a crop fails, a dairyman can always turn his cows into it and thus get some return for his labour. Undoubtedly, dairying appears to be perfectly safe here, when combined with cropping as a mixed farm.

Sheep.

The Merinos bred in the northern tableland districts are smaller in frame than those of the dry west, but the wool is finer and of better quality. Red soil stains the wool, and it is stated that a lower price is received on that account. Cross breeding for the production of early lambs does not appear to have been given much attention yet, but the Romney Marsh cross is largely used. When the short route to the coast is opened, there does not appear to be any reason why, with plenty of feed available on mixed farms, lambs from the Inverell district should not shake the reputation of "Prime Canterbury" on the British market. But it may be premature to speak too highly of what appears to be an untried industry.

Wheat growing.

In the northern districts generally, the amount of work done with the plough is much greater than in the south. Riverina farmers grow their wheat, even on fallowed land, with one ploughing, several cultivations, and many harrowings. About Inverell the larger farmers use ploughs and harrows only, and cultivators are rare. When the harrow fails to kill weeds, the plough is used again.

As there is no Experiment Farm in the district, there are no comparative results to show whether this is the best practice. On this farm the soil is of a friable nature, so that ploughing is not such an expensive task as elsewhere, and this factor alone may justify the practice of experienced men. Mr. Pietsch's two sons ploughed 144 acres in 12 days, using two ploughs of 5 and 4 furrows and 11 horses.

In continuous wheat-growing, the first ploughing is done as soon as possible after harvest, and the second just before sowing. The same practice is adopted with maize. Both disc and mould-board ploughs are used. The ground is ploughed, left fallow for a while, then harrowed, ploughed, harrowed again and sown.

The varieties grown by Mr. Pietsch are the hard wheats, Comeback, Bobs, and Manitoba; also a soft, late wheat, known locally as "Lambrigg," which yields well. Of all these, Mr. Pietsch prefers Comeback, which has given him a good crop, from 20 to 30 bushels per acre, every season for at least five years. Steinwedel and Federation are largely grown in the district, but Mr. Pietsch does not like Federation for his red soil.

The seed sown varies from ¾ bushel to 1 bushel per acre, according to the variety. Comeback and Manitoba take a little more seed than the other varieties.

Fallowing—a practice which is more common in localities less favoured in regard to rainfall—is adopted mainly for the purpose of controlling the black oat pest. Mr. Pietsch offers to back Inverell against any other portion of the State for the production of black oats. There would be many starters in such a morbid contest; but fallowing and running stock on the fallows when the oats come up is a very reasonable method of attacking the intruder. Mr. Pietsch's boys, however, claim that fallowing gives such excellent results that it is justifiable from the point of view of grain production alone.

Hay.

When the great frost of the 11th October, 1910, struck the northern districts, Mr. Pietch had 60 acres of wheat in flower. This was cut immediately for hay, and in nine weeks there was another crop which gave 9 bushels per acre. It is quite safe to say that in the Wagga district such a result would not have occurred.

Care is taken to cut wheat for hay before there is any grain in the heads, or the mice will riddle it in the sheds. This is a danger to which lucerne hay is not exposed.

Algerian oats give excellent hay returns, and Mr. Pietsch has gathered 3 tons of oaten hay per acre. From 1 to 1¼ bushels of seed per acre are sown. The farm horses are fed on the best oaten chaff, and oat grain. Lucerne chaff is given for a change, to keep their bowels in order.

Smut has appeared in the Algerian oats, but bluestone pickle was found effective.

Maize.

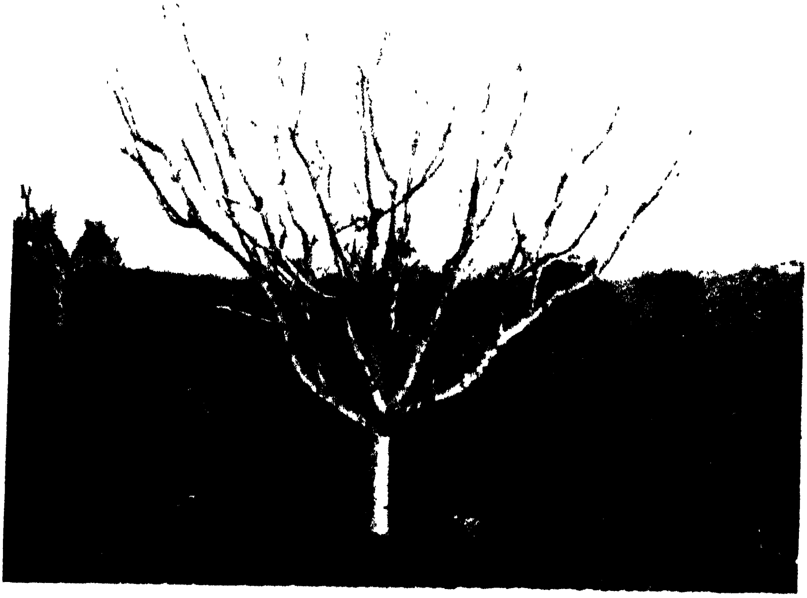
Sometimes Comeback wheat is grown for hay with the object of outstripping the black oats—on the same principle as Firbank is grown in Riverina. The variety is so early that it can be cut before the oat seeds ripen. After the hay is removed, the land is sometimes prepared immediately for maize, which can be sown as late as January. There are differences of opinion as to the wisdom of this double-cropping, but it speaks well for the Inverell soil and climate that it can be considered at all.

Crossing the bed of Fraser's Creek, Nullamanna.

[illegible]

Milking-machines in use, Mr. E. Pietsch's Glencoe Farm, Nullamanna

MIXED FARMING AT INVERELL.



Early Rivers Nectarine (pruned), showing fruit-spurs. Mr. W. H. Fox's Ashfield Orchard, Beaulieu.

Wickson Japanese Plum. Mr. W. H. Fox's Ashfield Orchard, Beaulieu.

MIXED FARMING AT INVERELL.

Maize is not as heavy yielding in Inverell district as on the Clarence or Hawkesbury Rivers, but it is still a safe and profitable crop. A yield of 30 or 35 bushels per acre would be considered a good one. Some further remarks on the crop will be found below.

Other Crops.

Lucerne has been mentioned above. The red soil is very suitable for it, and good crops are obtained on the black soils also. Lucerne paddocks are to be seen here and there throughout the district. Growth is of course dependent upon the rainfall, but Inverell farmers have found the truth of the axiom that after a dry spell, lucerne is the first crop to make a profitable growth.

Potatoes have given yields of 4 or 5 tons per acre. The soil about Nullamanna is similar to that of the famous Red Range, but the rainfall is not quite as high. Brownell's Beauty is the variety generally grown.

Sorghum gives an abundance of cow-feed, and, of course, care is taken not to feed the cows upon immature or frosted sorghum. Pie-melons grow well in the driest times Mr. Pietsch has on one occasion fed them to sheep with splendid results. That year there was a fall of 3 inches of rain in March, upon which the melons grew, but which was followed by a long dry spell.

Summing up, Mr. Pietsch finds Nullamanna an excellent dairying district, and he recommends that dairying be combined with pig-raising, sheep, and the cultivation of wheat for grain and hay, maize, lucerne, potatoes, Algerian oats, and sorghum. He has not done much in regard to fruit-growing since he came to Nullamanna.

A LITTLE FARM WELL TILLED.

At "Ashfield," Beaulieu, 6 miles from Inverell, on the road to Gum Flat, Mr. W. H. Fox has a block of 130 acres, of which about 40 acres are cultivated. The site is a good many hundred feet above Inverell, so that there is very little danger from severe frosts. Mr. Fox bought this block fifteen years ago at £2 per acre, and upon it he is raising a family of six children.

Mr. Fox grows whatever he can sell. It is a striking proof of the great need of the district that his operations are restricted not by the capability of the soil nor the limits of the rainfall, but by the requirements of the town of Inverell. All his produce is sold locally.

The block embraces red and dark brown soils, of the same character as are to be found elsewhere in the district. The ground is easy to work, and with proper treatment will grow any crop for which there is a market.

Mr. Fox finds two horses sufficient for a two furrow plough. Even in the driest weather the soil does not set hard. He has only three horses on the farm, and, with the aid of the one man whom he employs all the year, he can plough and cultivate at the same time It is understood that much of the land in Inverell district is much stiffer and more expensive to work than this, but the time at my disposal would not permit of more extended inquiries.

Fruit.

He regards his orchard as the most valuable portion of his property. There are 11 acres of vines and trees—6 acres of peaches, nectarines, cherries, plums, pears, and apples, and 2 acres of grape-vines are in bearing, whilst a young orchard of oranges will soon be yielding fruit.

Mr. Fox ploughs his orchard land, and harrows it down to as fine a tilth as he can get. When the harrow will not kill the weeds a Planet Junior cultivator is used. The soil is reduced almost to red dust, the whole aim being the conservation of moisture. As the ground is porous by nature, Mr. Fox does not find it necessary to leave it rather lumpy in order to catch the rain. The ground is made as fine and level as possible, all traces of the plough furrows being worked out, and all the rain enters the soil where it falls.

The orchard is sprayed regularly to control disease, and pruned in accordance with the best known methods. Mr. Fox aims at producing the very best fruit, and selling it at a fair price. For the past two years he has sold it on the farm, mostly to traders. People are quite willing to come for the fruit, and the demand exceeds the supply.

The vines are all on Phylloxera-resistant stocks. Phylloxera has not appeared in the district, but Mr. Fox uses these stocks for two very good reasons. The first is as a precaution against the possibility of an outbreak of the disease; and the second reason is that vines grafted on these stocks grow so vigorously that the crops are obtained at least one year earlier than if they were on their own roots, and they bear regular crops. Black spot is checked by the sulphuric acid treatment in the winter, and the use of Bordeaux mixture in summer. Lime-sulphur solution is to be tried, on the recommendation of the Fruit Branch of this Department.

Mr. Fox has obtained certificates from the Royal Agricultural Society for bottled and dried fruits, but he only treats sufficient in these ways for household use, the demand for fresh fruit being so great that he has no surplus.

Principles of Cultivation.

In his general farm work, Mr. Fox does not follow any definite rotation of crops, but grows whatever appears to offer the best prospects at the time. He avoids growing two crops running of any kind on the same ground. An exception is made in the case of maize, which gives two good crops consecutively on the rich dark-brown soil; but the general principle is to change the crop each year.

With a farm of 130 acres, winter fallowing would probably be unwarranted in a district of 32 inches rainfall, but the field officers of this Department strongly recommend the shorter summer fallow for wheat. Mr. Fox disapproves of what he regards as the opposite extreme to fallowing—attempting two crops in the one year. He breaks his ground three or four months before sowing, and gives it a short, well worked bare fallow. In his opinion, these are the best principles for a small farmer to adopt in Inverell district—change the crops, prepare the soil early, and grow what pays; but be careful always to procure the very best of seed obtainable.

Maize.

The past season afforded a splendid test of the portions of the State which may be regarded as "safe" for maize. The fact that maize has been selling for 5s. 3d. and 5s. 6d. per bushel for months past, is proof positive that the crops were decimated by the summer drought. The faith of many was shaken in the great cereal, and some inland districts which expected a considerable extension of the area sown to maize, will have to look elsewhere for crops to suit them.

Not so Inverell. With proper preparation of the land to conserve moisture, and attention to the other factors of good farming, maize will give profitable crops in this district even in a season like the last. At the end of May, a crop of Early Mastodon maize, on dark-brown soil on Mr. Fox's farm, carried two and three great cobs to the stalk. It was a splendid crop, and, when current prices are considered, it is clear that on this block Mr. Fox has certainly "grown what pays."

This was a second consecutive crop on the same land. As soon as the previous crop is harvested, Mr. Fox rakes the stalks together with a home-made rake and burns them. He then ploughs deeply at once, in June, and harrows immediately after the first rain. Early in spring the ground is ploughed again, and worked down to a fine tilth. If the ground is fine and loose, however, the Planet Junior cultivator is used instead of the second ploughing. The seed is sown in September and October. On account of the elevation of the farm, no loss has been sustained from frosting of early sown crops.

As soon as the corn is up, the harrow is run right over it. This pricks out thousands of young weeds, which can be seen turned up in the track of the harrow. Then during the growth of the crop the Planet Junior cultivator is used three or four times between the rows.

The variety Early Mastodon is preferred. Boone County White, grown from seed supplied by the Department of Agriculture, has done very well, the only objection to it being the market prejudice against white maize. Riley's Favourite, supplied by the Glen Innes Experiment Farm, is also a good variety for the district. Early Leaming and Yellow Dent have been tried, but Mr. Fox did not find them as good as the others.

Potatoes.

Mr. Fox has tested twenty-four different kinds of potatoes, and prefers Brownell's Beauty. This year he had 6 acres sown, on well prepared ground, but only 2 acres gave a good crop, about eighty bags. The balance was ruined by the drought, and only gave four or five bags per acre. Three acres, however, were sown very late.

In treating for scab, Mr. Fox found that formalin was injuring the eyes, so he reverted to the old treatment with corrosive sublimate. He dissolves 2½ oz. of this in 15 or 16 gallons of water. The solution is placed in a 30-gallon cask, and the potatoes are soaked in it for two or three hours. They are then spread out on a cloth to dry, and others immersed in the solution. As soon as they are dry on the cloth, he cuts them and throws slaked lime over them to prevent bleeding. They are sown the next or the following day. Mr. Fox states that he has always had good results from this treatment.

Some experiments have been tried with five different manures—superphosphate, sulphate of potash, sulphate of ammonia, dried blood, and bone dust—in several combinations for potatoes, check rows being left unmanured; but, owing to the dry season, no beneficial results could be observed from the manure. But manure gave very beneficial results on melons, pumpkins, tomatoes, cabbages, and sweet potatoes, the unmanured beds making nothing like the growth of the manured ones. Further manure trials will be made next season.

Tomatoes.

Mr. Fox has found the growing of early tomatoes very profitable. He raises the seed in boxes, under glass, with a few sheets of iron so placed as to reflect the heat of the sun into the boxes. The seed is sown in July, and from the seed-boxes the plants are taken straight to the paddock. For the seed-bed, the dirt is taken from hollow stumps and mixed with fowl manure. The tomatoes are ripe about Christmas.

Usually two rows, each 6 chains long, are planted out. One row is set out early, and the tomatoes are given attention by pruning, &c., for early crops. The other row is put out later, and allowed to take its chance.

Mr. Fox has found the varieties Early Pride and Livingston Coreless to be very suitable for the district.

Other Lines.

A few cabbages are sold in Inverell, and these and other vegetables are grown for home use. Three cows are milked, and enough butter is made to meet the requirements of the home. From time to time other crops are tried in a small way, as Mr. Fox will grow anything which offers a reasonable prospect of being found to pay. He has no hopes of realising a fortune from his little farm, but he makes a comfortable living from it, and he is pioneering many branches of industry which will be of value to Inverell when the district reaches the great future which is certainly before it. Mr. Fox's farm is a little private experiment station, and as he takes a prominent part in all public movements connected with agricultural progress, much valuable information is being gained from his experience.

THE DROUGHT IN THE NORTH-WEST.

Between Inverell and Moree there appeared to be plenty of rough feed for sheep, and a fair supply of water, but shortly after leaving Moree the train ran into bare black soil plains, with only occasional sections of dry grass. Long before reaching Narrabri and Gunnedah there was abundant evidence of the dry period through which the north-west was passing. For miles the plains were as bare as a billiard-table, while here and there in the timbered area, men were engaged in the old sad work of cutting scrub for sheep. Dead and dying sheep, the camps of skinners, and the carrion crows, brought us back, with a touch of fatalism, to the dreary days which ushered in the present century—those bad old days when we watched the stock dying on the plains, and there was no defence problem, because nobody wanted Australia but ourselves. There was nothing then to indicate the suddenness with which the drought was to end on the 10th June. Our hearts go out to the men and women who struggle on through the weary time in the west, and we ask ourselves is it any use hoping for closer settlement and happy homes in the interior of the country when these droughts come with such blighting force, and such irregular but certain intensity? Why not concentrate our efforts upon the coast and tablelands, which can carry millions of prosperous people, and leave the back-blocks what the explorers found them—"desert, desert, desert!"

But no; our western people are on the verge of victory, instead of defeat. They have had a run of very fair seasons, and they have not gone into battle as hungry men. And the very prosperity of the east gives us hope, for there are districts where sheep died in 1902 which have gone through this shorter but equally severe drought without the loss of a single beast. As agriculture advances, drought loses its power. Down in Riverina the farmers are fallowing their wheat lands and feeding their sheep on the stubbles. Sheds of hay and stacks of straw, wisely preserved but long regarded as not of much account, are now going through the chaffcutter in all districts which agriculture has reached. Silos—each a little blockhouse—are being opened in many localities. Scientific experiment and laboratory test are discovering new methods of conservation, and new crops are being grown to suit dry conditions. Best of all, a start has been made to bar up our inland rivers, and less water will be allowed to run away to the sea. The great enemy has won a partial victory in the recent campaign, but in each attack he finds us stronger, and eventually we shall have him in chains.

SHOOTING POTATOES FOR EARLY SOWING.

THE only way to induce shooting before the warm weather commences is to keep the potatoes in a warm, well-ventilated shed or room. At the end of June the Department of Agriculture had some potatoes, which were dug late in May. They were kept in a warm room, and had developed fairly long shoots.

Farmers should not take too big a risk by sowing too early. The safe date for any particular district can generally be ascertained by inquiring from experienced neighbours, or the Department will be pleased to give advice in answer to inquiry by letter.—GEORGE VALDER.

Maize.

[Continued from page 443.]

A. H. E. McDONALD, Inspector of Agriculture, North-west District.

SOWING.

MUCH depends on the method of sowing practised. The vigour of the individual plants may be largely impaired by faulty sowing, such as placing the seed too deeply in the soil, which necessarily reduces the yield ; while the yield may also be lessened either by the seed having been sown so thickly that the plants have not sufficient room to develop, or so thinly that the stand is not thick enough.

The essential parts of the seed are the germ or embryo, and a supply of food to nourish the embryo until it puts forth green leaves to absorb the nutriment the plant derives from the air, and roots to draw upon that secured in the earth. Should the seed be sown deeply, the young plant takes a considerable time to reach the surface, and during this time it is drawing upon the nourishment stored in the seed. This becomes exhausted, and the plant is weakened.

Large seed contains a greater supply of food, and the plant from such is less affected by the seed having been sown deeply than the one from a seed sown at a shallow depth.

The Depth to Sow.

The ideal depth is the shallowest at which sufficient moisture will be available for germination and to supply the young tender roots for a reasonable time. This, of course, depends upon the climate and the nature of the soil. In some of the drier States of America it has been found necessary, for instance, to adopt a practice of "listing" to secure this optimum condition. Listing, briefly, is the opening of furrows, in the bottom of which the seed is sown by a corn-dropper, which covers it to a depth of about 2 inches. The listing plough moves out of the way the dry upper surface, and exposes the moist favourable soil.

In fine moist soil, free from weeds or the seeds of weeds, it is unnecessary and indeed inadvisable to sow more than 2 inches deep. At this depth the soil remains moist long enough to develop the roots, and as these grow longer they penetrate the soil and are able to absorb moisture from greater depths.

It is mistakenly supposed that if seed is sown deeply, the plants will, as a natural consequence, be deep-rooted. The shoot, or "plumule," as it is called, grows upward after germination until it reaches the light, and then remains practically stationary in growth, while it throws out a new set of roots just beneath the surface. When these are formed they take up the functions of feeding the plant, and the rudimentary roots cease to be of service. By deeper planting than is necessary to secure germination, therefore, no good purpose is served. On the other hand, the plant may be weakened by being compelled to draw upon the nourishment stored in the seed while it is reaching the light, and which could otherwise be utilised in the development of leaves and roots.

Method of Sowing.

The practice of ploughing-in seed is to a large extent followed by farmers; but in the light of these facts it can be seen that it is not good. If ploughing-in is done, however, it should be as shallow as possible. Apart from the fact that ploughing-in places the seed too deeply, it is an unsatisfactory method in that it covers the seed with loose soil, while to secure good germination the soil should be firm. In soil which contains a large amount of moisture this may not matter very much, but it is a point of great importance when there is no surplus. Rolling after ploughing-in will remedy the looseness to some extent, but this is not altogether satisfactory.

When a modern corndropper is used on properly prepared land, the seed can be sown to the best advantage. It can be placed at the right depth, at the right distances, and the soil is made firm around the seed where firmness is required, while on the remainder of the field the surface is left in the loose condition which is so valuable in retarding evaporation.

The Lister System.

As before mentioned, the maize-growers in the drier districts of the United States have evolved a system of planting known as "listing," which enables them to utilise moisture existing in the soil several inches below the surface to promote germination. Furrows, 4 to 5 inches deep, are opened by a plough with a mould-board which throws the soil to each side. A corndropper follows in the furrow, and drops the seed either singly or in groups of two, three, or four at regular distances. The corndropper is fitted with a coulter which opens the soil an inch or two inches deep for the reception of the seed, while in the rear is a wide wheel which covers the seed and presses the earth firmly about it.

"Check" Planting.

The dropper may be set to drop single seeds a few inches apart, but the usual practice followed in the United States is what is called "check" planting. This means the planting of the maize in "hills," usually three grains being dropped in each. The hills are generally 3 feet apart; while the rows are usually about 4 feet apart. By an ingenious arrangement the hills are placed at regular distances, so that when the plants appear they line in every direction, like the trees in an orchard.

This regularity is secured by a corndropper so fitted that the number of seeds required for each hill, say three, drop into a receptacle, in what is known as a "runner." A fine wire is stretched across the field, and at intervals of about 3 feet a knot is placed on the wire. A trip runs on the wire, and when a knot is struck the seed in the runner is dropped.

Although it may appear at first sight that such a method of planting is tedious, and would require more time than the ordinary method, in practice it is not so, and the planting can be done quite as expeditiously as by any other method in which the corndropper is used.

Check planting is of undeniable advantage where the land is weedy, since cultivation can be given both ways and very few weeds escape.

Where Listing is Valuable.

The listing method has been practised at the Hawkesbury Agricultural College for many years, and the successful results obtained justify a recommendation of the adoption of the system in all the drier districts. It is only applicable, however, where the soil is fairly warm. In the cool tableland districts it is scarcely advisable to adopt the practice, as the seed being placed in dead cold furrows does not germinate as quickly as when it is sown nearer the surface. On hillsides also, where the contour of the land is likely to lead to washing, it is not advisable.

In dry districts where it is found that it is generally necessary to plant at or about a given time, the system is extremely valuable. In the North-Western districts of this State, of which Tamworth is a centre, it is found that the end of September or the beginning of October is the best time to sow. It may happen that at this time the weather is dry, and that if the ordinary system of sowing were followed the seed would fail to sprout. In almost all years, however, when a preparatory system of fallowing has been practised, there will be abundant moisture in the lower soil, and by listing, the seed may be sown in this and germination ensured.

In dry weather it is necessary to sow the seed immediately the furrows are opened. If only half an hour intervenes between the opening of the furrow and the sowing of the seed the germination will probably be affected.

One of the advantages of listing is that it facilitates the destruction of young weeds that grow near the plants These weeds cannot be reached by the tines of cultivators, but as these implements are worked in the rows, they fill up the furrows and smother the weeds. As the maize plants grow rapidly and soon attain a good height, they are not covered during the process of cultivation.

Where check planting cannot be done, the method of dropping single grains in a furrow is the next best in facilitating the cleaning of the land. In the first the weeds can be kept down for a considerable time, as cultivation can be continued both ways until the crop shades the ground, whereas listing only facilitates the destruction of the first crop of weeds.

In those districts where it is not advisable to furrow out before the corndropper, either on account of low temperatures or the steepness of the grades, the seed is best sown on the surface by a corndropper. This implement can be set to sow at varying depths, but generally 2 inches will be quite deep enough. If the surface is slightly dry or cloddy a small furrow opener can be attached to the corndropper, which allows the seed to be planted slightly deeper in more favourable soil.

Distance Apart to Plant.

The space allowed the plants depends upon several factors. As a rule, paradoxical as it may seem, the greater the fertility of the soil the more room should be given the plants. In rich soil, with a fair amount of moisture, great vegetative growth is made; and if the crop is too thick, sunlight is excluded, and cobs are either not formed or they do not develop to a full size. On less fertile soil the stalks do not grow very high, and the leaves are less luxuriant, while the cobs do not seem to be materially affected. On the other hand the cobs do not exceed a certain size, and the effect of giving each plant more room is merely to decrease the number of stalks per acre without increasing the size of the cob—consequently the yield is decreased.

This is notably the case at Tenterfield, where a large amount of maize is grown. In that district the maize stalks appear absurdly short to one who is accustomed to coastal crops, and causes speculation as to whether the crop is worth growing. The average grain yield, however, is very fair. The seed is always planted closely—that is 4 feet between the rows and 15 or 16 inches between the seed in the rows. If greater space is given, the yield is invariably lessened. In this district the limiting factors in leaf and stalk development are the low fertility of the soil and the low temperatures.

In the coastal districts where the soil is rich, an abundance of moisture possible, and the season long and warm, a great growth of foliage must be expected, and sowing made in preparation for such. Thick planting under such circumstances is likely to result in loss. Five feet should be allowed between the rows, and a space of not less than 16 inches left between the seeds in the row.

In those districts such as the north-west, of which Tamworth and Inverell are typical, where the soil is rich, but a limiting factor in growth is the rainfall, the plants should be allowed plenty of room. The distances between the rows may vary from 4 feet 6 inches to 5 feet; while the seed should be 16 inches apart. In these districts a fair space must be allowed, so that in dry seasons each plant will have a greater soil area from which to derive its moisture. On the other hand, should the rainfall be above the average and produce an abnormal growth of stalk, the plants will not be crowded out.

Single Grains v. Hills.

A question which is frequently discussed by growers is whether it is better to sow single grains short distances apart, or three grains together at greater distances. Usually when single grains are dropped, about 16 inches separate each, while when the grain is planted in hills, three grains are dropped every 3 feet.

Taking it that the number of stalks per acre is equal in both systems, the single grain method will generally give the best yield. Each plant has its own space, and is not shaded by other plants as it is when the hill system is practised; neither is it overcrowded by stronger plants.

These remarks only apply when no attempt is made to check plant the hills. As before mentioned, check planting enables the grower to cultivate both ways, and thereby gives an advantage which outweighs any disadvantages.

Selecting Seed.

Generally no difficulty is experienced in securing good germination, provided sound bright seed is selected. Diseased corn will not germinate well, and to avoid its inclusion amongst seed the cobs should be carefully examined before shelling, and any showing signs of disease discarded.

Weevils.

During the period between harvesting the grain and seed time, weevils may infest the seed and destroy it. This pest is specially prevalent in the warmer moist districts. If only a percentage of the seed is attacked by weevils serious loss will result, as it is impossible to pick out the infected grains, and as these fail to grow the crop is thin. Bad ventilation, through keeping the store-room warm and increasing the humidity of the atmosphere by preventing the egress of moisture given off by the stored grain, encourages the presence of weevils. Warmth and moisture are desired by these insects, and by eliminating such conditions they can be kept in check. Many wheatgrowers have discovered to their cost that seed stored in closely walled-in barns is very liable to attack, while that stored in open sheds, or merely stacked in the open and covered by a few sheets of iron, is immune.

Storerooms, in addition to being well ventilated, should be kept thoroughly clean. Dirt and old seed harbour weevils and other insects, and from the rubbish they spread to any good grain placed in store.

Should weevils make their appearance, they can be destroyed by putting the seed in airtight tanks or boxes and treating it with carbon bisulphide. It is only necessary to put a small quantity on the top of the grain, keeping the tank closed for about twenty-four hours. The liquid is volatile, and the fumes being heaver than air sink downwards through the grain. This chemical is highly inflammable, and must on no account be brought near a flame. A lighted pipe will cause it to explode. Further, it is not necessary for the liquid to come into contact with a light—vapour is given off which is also inflammable.

Where the winters are severe, the seed may be frozen, and this destroys or weakens its vitality. In our State, however, the temperature never becomes so low as to damage the grain. It is sufficient if the seed is kept dry.

Seed should be selected which is well filled. Small pinched seed is somewhat deficient in vitality, and the supply of plant food is not sufficient to give the young plant a good start. If the soil is in an unfavourable condition at seeding time, the bad results accruing through sowing pinched seed will be specially marked.

Asparagus Culture at Bathurst Experiment Farm.

R. W. PEACOCK, Manager.

Upon the irrigation area of this Farm, 1½ acres are under this crop. Half an acre was planted in 1896, another half-acre in 1900, and the remaining half-acre in 1901.

The soil is a rich dark alluvial clay loam, slightly too clayey for best results from asparagus. The average rainfall is 23½ inches per annum, and the plots are irrigated to provide a satisfactory amount of moisture.

The crop has proved profitable, as is shown by the returns for the past seven years :—

	£	s.	d.		£	s.	d.
1905 ...	83	4	2	1909 ...	119	1	8
1906 ...	77	3	8	1910 ...	73	12	8
1907 ...	121	19	11	1911 ...	120	3	9
1908 ...	126	9	11				

This is an average return per year of £103 3s. 10d. from the whole area, representing an average return of £68 15s. 10d per acre. The prices obtained were from 4s. to 6s. per dozen bunches wholesale. The fluctuations in yield were largely due to unseasonable frosts and lower temperatures than during normal seasons.

From these figures it will be seen that this crop is worthy of more attention than is ordinarily given to it. The main reasons why it is not more extensively grown are that no return is obtained for the first few years, and also the impression that it is a difficult crop to grow, requiring a great amount of hand labour. The ordinary Australian farmer does not interest himself in such crops, but leaves them rather to the professional market gardener. In the Bathurst district, however, on account of the success achieved at this Farm, one farmer has planted 10 acres.

In France and America, where this crop is grown very extensively, the methods employed are calculated to bring it into the province of the farmer. In America, asparagus farms of several hundred acres in extent are not uncommon. As much as 1,000 acres are grown for canning, and the profits from them are very satisfactory. This has been brought about by the application of new methods of culture, which allow of the use of machinery.

As there are many inquiries respecting the growth of this crop, the following has been written to help those who are desirous of attempting it :— Asparagus is a branching herbaceous plant, attaining to the height of from 5 to 6 feet. It is a perennial, possessing a large root stock and fleshy roots, in which it stores nutriment to tide it over the winter. It is upon the vigour of this root stock and root system that its value depends, thus enabling it to send up, upon the return of warm weather, quantities of young sprouts, which are used extensively as a vegetable. Its period of most active growth is during the summer, it being dormant throughout the winter.

Varieties.—Of the edible species, there are several of what are considered distinct varieties. These are probably the result of differences of soil, climate, and culture. Of the varieties grown at the Farm, Connover's Colossal and Pride of Brunswick have proved the superior. The others were Erfurt Giant, Giant Dutch, White Mammoth, and Camden Park.

Choice of Soil and Situation.—Asparagus can be grown on a variety of soils, in fact any that could be made into a good garden loam. It thrives best upon sandy loams, moderately deep, and rich in vegetable matter. Heavy clays, and those with a hardpan, or any that are cold and wet, should be avoided. Soils containing stones are undesirable, as such interfere with the cutting and cultivation. As asparagus requires all the sun it can get, the land should have a northerly aspect, and should not be shaded by trees and shrubs.

Preparation of the Soil.—Soil which has been worked deeply and manured heavily with farmyard manure for root crops, and kept free from weeds, is most desirable. The land should be subsoiled to the depth of from 18 to 20 inches, except in soils which are loose and friable to that depth. The old method of trenching to the depth of 24 to 30 inches is not practicable in field culture, nor is it necessary. Asparagus is a deep-rooted plant where the conditions are favourable—the roots of the eight-year old plant in Fig. 1 had gone to the depth of 4 feet 4 inches. The land should be thoroughly worked during the autumn and left to mellow during the winter, when it should be again ploughed and drilled ready for the reception of the roots in the early spring.

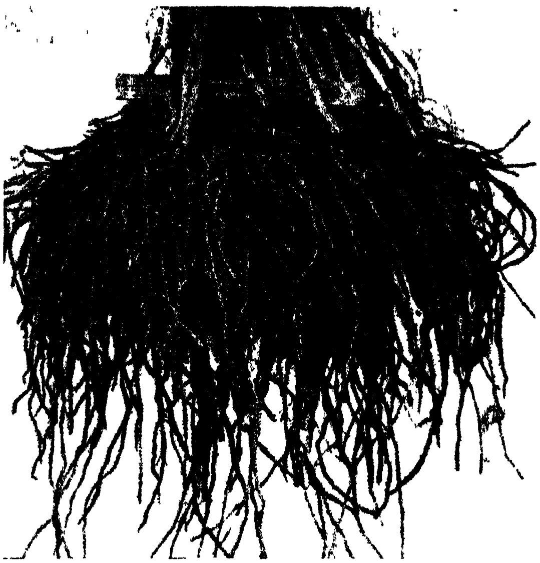


Fig. 1.—The root-system of a plant of asparagus planted at Bathurst Farm in 1896—eight years from seed.

The raised bed method, as generally practised in garden culture, is not to be recommended under Australian conditions, and is only permissible where an abundance of moisture is ensured. The flat field culture has much to recommend it.

Raising Plants.—Fresh seed should be sown in the spring in well prepared soil in rows about 2 feet apart and about 4 or 5 inches in the drill. The seed germinates slowly, and if soaked in warm water for twenty-four hours germination will be hastened. Cover about 1 inch deep. The land should be well worked and kept free from weeds. By liberal treatment vigorous yearlings are produced. In setting out care should be taken not to expose them to the sun or drying winds. It should be done just prior to their new growth in the spring.

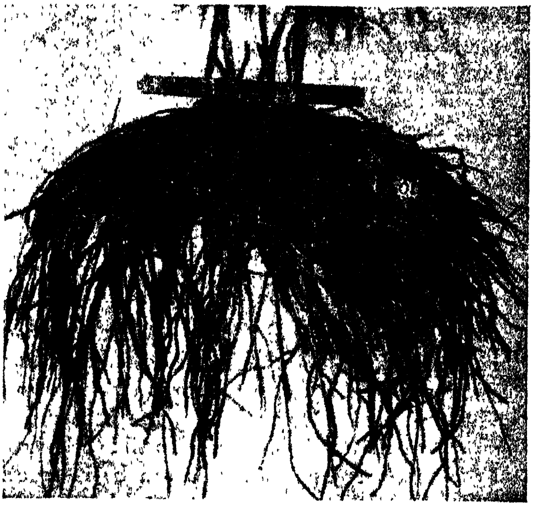


Fig. 2.—The root-system of a plant of asparagus planted at Bathurst Farm in 1900—four years from seed.

Selection of Plants.—Only vigorous plants should be used. Select those that have the thickest, most succulent, and vigorous stems. Choose tall rather than shrubby plants. Vigorous yearlings are to be preferred. If two-year-old plants are used, choose those with imperfect flowers which do not bear seed. Seed-bearing is exhaustive.

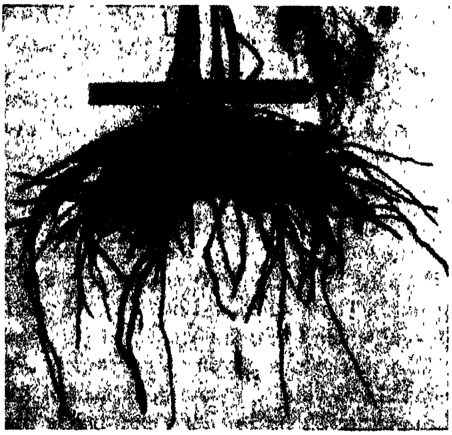


Fig. 3.—The root-system of a plant of asparagus planted at Bathurst Farm in 1901—three years from seed.

Planting Out.—The distance apart to place the roots is a debatable question, and no hard and fast rules can be laid down regarding it. Where the soil is light and moisture limited wide planting should be followed; upon richer, moister soils they can be planted closer. Closely planted beds soon become a mass of roots, which require very heavy feeding and watering to retain their vigour. Eventually the over-crowding is apparent in weak, thin, and unprofitable sprouts. As the beds or fields will, with proper care, last a life-time, it is important that the initial work be done thoroughly, and sufficient room be left for root expansion. I would strongly recommend the rows being drilled 4 feet apart each way, and the roots set in their intersections. In light soils they may profitably be planted 5 feet each way. This method allows of cultivation both ways, which is a consideration in the eradication of weeds and conservation of moisture. The drills should be opened out about 9 inches deep and the roots set in the bottom, care being taken to spread the roots in their natural positions, and the crowns covered by about 3 inches of soil. If Blanched Asparagus is required the crowns should be placed about 6 inches below the surface; if Green Asparagus they should be planted shallower. The natural growth of the crown forces it towards the surface, and the original depth can be maintained by applications of abundance of farmyard manure. The drills are levelled by cultivating towards the plants.

After Treatment.—First Year.—After planting out the land should be kept free from weeds throughout the summer, and frequently cultivated to conserve moisture. When the stems turn brown they should be cut down and either carted off or burned on the beds or fields. The land should be thoroughly cultivated, and where possible a liberal application of well rotted farmyard manure applied; this can be more economically applied during winter than in the spring. Early in the spring the land should be again thoroughly cultivated, and any artificial fertiliser applied.

Second Year.—The summer cultivation is continued, as it is most important. During the summer months the plants are preparing fresh stores of food in their roots and require liberal treatment; neglected plants are longer before becoming remunerative. In the autumn the stems should be cut off before the seeds fall, as asparagus seedlings are one of the worst pests. Where practicable, it would be wise to go through the plants and cut out all seed-bearing stems rather than cut the whole before surrendering their nutriment to the roots. It should then be treated as during the first year. If the plants have been liberally treated, a light cutting may be taken off the following spring, care being taken not to cut too hard.

Cutting.—Old established roots can be cut for about ten weeks before being let run up to stem and leaf. Younger roots must be cut lightly and treated with judgment. Throughout the cutting season, all small as well as marketable shoots should be cut clean away; otherwise they exhaust the roots, and reduce the marketable output. The field should be gone over and the shoots cut each day, as the leaf-buds, which form the tip, should not be allowed to open before cutting. The method of cutting varies with the demands of the market. If Blanched Asparagus is required, it should be cut when the tops show above the ground, and about 8 or 9 inches below the surface; this system necessitates the earth being ridged over the crowns. In cutting, care should be taken not to injure other ascending shoots. For Green Asparagus, the shoots are cut when about 7 inches high, cutting about 2 inches below the surface. An intermediate method is to cut when about 4 inches high, and about the same distance below the surface. This product is then half white and half green. A great diversity of opinion exists respecting the merits of the different systems. Personally, I lean towards the green, as a larger proportion is edible. After cutting, it should be subject to as little exposure as possible in the fields, and any dirt which may adhere to the stalks rinsed off; it is better not to wash the whole stalks, and the less water used the better. If the bunches are to be kept over night, they should be dipped in clean water and stood on end upon clean straw which has been thoroughly wet. The bunches should be from 8 to 9 inches long, and tied with raffia or string. If for local market, one string is sufficient; if to travel any distance, two are preferable. The stalks should be graded into different qualities.

Manuring.—Asparagus, to be profitable, should be forced, and quick-growing succulent shoots should be aimed at. To ensure such, the manuring must be liberal. Large quantities of farmyard manure mixed throughout the lower layers of the soil are not necessary, excepting when required to ameliorate heavy soils. Fifty or sixty tons of well rotted farmyard manure to the acre is a fair dressing, and can be applied most economically after the stems are taken off in autumn. It should be well rotted previously, to destroy seeds of weeds, and worked into the soil by subsequent cultivation. Applications of commercial fertilisers should be made in the spring, directly after the cutting is finished, and prior to cultivation. Applications of the following have given good results upon many soils:—

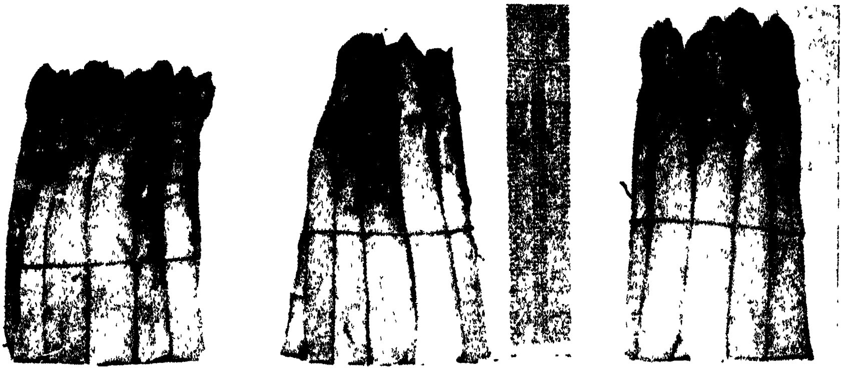


Fig. 4.—Average bunches of asparagus grown at Bathurst Farm.

250 lb. nitrate of soda,
400 lb. superphosphate, and } per acre.
150 lb. muriate or chloride of potash.

At this Farm a manurial experiment with commercial fertilisers was carried out during 1906 and 1907. The results were not decisive, owing no doubt to the inherent richness of the soil and frequent dressings of farmyard manure.

Common salt is now but little used by commercial growers; the application of such manures as nitrate of soda and chloride of potash would to some extent take its place. Asparagus is unlike many other plants, and can stand a very large quantity of common salt. The mechanical condition of the soil should be kept good by applications of farmyard manure, and commercial fertilisers used to supplement it.

Injurious Insects.—Asparagus is attacked by a number of insects which feed upon the plants, the most harm done in America being due to two forms of asparagus beetles. They have not made their appearance at this Farm.

Fungus diseases.—The principal of these, causing serious damage, is asparagus rust, which also has not appeared here.

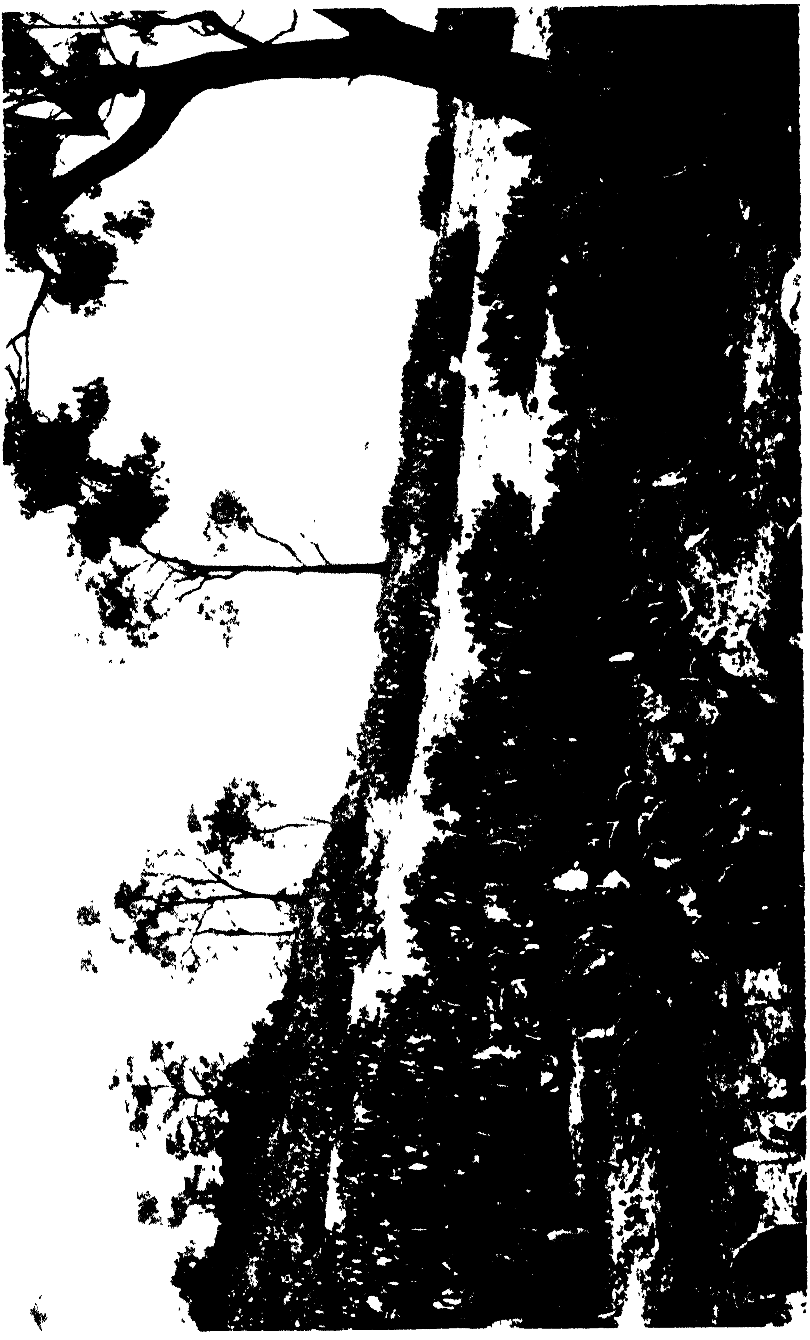
EARLY SPRING FEED FOR SHEEP.

A CORRESPONDENT in Gunnedah district asks the Department to suggest a fodder crop to sow for sheep between July and September. Probably the only quick-growing fodder crop which could be put in now with safety would be Skinless barley, mixed with either field-peas or tares. Cowpeas should not be sown until frosts are over—say in September or October. Lucerne also is best sown after frosts are over.—GEORGE VALDER.

AN IMPROVED METHOD OF ARTIFICIAL POLLINATION IN MAIZE.

IN the breeding of maize all pollinations must be done by hand, and it is necessary to protect the silks from pollination by any other plant than the one intended. The usual method of making self-pollinations is to cover the tassels and young ears in strong paper bags. When ready the pollen accumulating in the bag around the tassel is dusted over the silks. But whilst this is being done the silks are exposed to pollen floating in the air.

Messrs. G. N. Collins and J. H. Kempton have devised a simple means of overcoming the difficulty (Circular No. 89, Bureau of Plant Industry, United States Department of Agriculture). A strong paper tube is made, 4 inches in diameter and 40 inches long. One end is wired over the tassel and the other over the young ear. The pollen will then fall down the tube on to the silks. Two extra folds are given where the paper is cemented, so as to give an even curve to the tube and allow the stalk to grow. When cross-pollination is desired, plants growing in adjacent rows can be connected similarly. The wire is coiled round the point of a lead-pencil before use, so that it can expand as the ear grows.



The Pest Pear (*Opuntia inermis*, var.), near Scone, N.S.W

The Prickly Pears of Interest to Australians.

J. H. MAIDEN,
Government Botanist, and Director of the Botanic Gardens, Sydney.

No. 4.—The Pest Pear of New South Wales and Queensland (*Opuntia inermis*, P. DC., var.)

SCONE, in New South Wales, about 200 miles north of Sydney, on the Great Northern Railway Line, which leads to Queensland, is the first place in Australia from which pear seriously spread. It was brought to Scone by Dr. Carlisle soon after 1839, as a rare plant in a pot. It doubtless came from Sydney originally.

Thence it was conveyed to Warwick, on the Condamine River, in Southern Queensland, and from thereabouts it has spread over enormous areas in Northern New South Wales and Queensland. Scone was the innocent focus of it all.

I cannot prove it, for early prickly pear records are very empirical, but I believe it is most probable that the first pest pear was brought by Governor Phillip when the First Fleet touched at Rio, and that it was one of the pears intended as a host for the cochineal insect which, amongst other desirable things, it was hoped to introduce into New South Wales.

It is one of the species of pear which has run wild in the Sydney district, but it is not a pest there, the climate being too humid It is one of several species which has run wild in New South Wales and Queensland. Some are far more formidable looking, but not one species is comparable in its aggressiveness to the Pest Pear. All the others put together have not spread a millionth as much as the species which is referred to in this article, and which is, by the majority of Australians, simply referred to as "Pear"—it is *the* Pear to them.

What has given pear its chance is the fact that in Australia it has practically a virgin continent in which to spread. It does not attain its best development in the coastal districts, which are those of comparatively high rainfall, and of high density of population. In the regions climatically suited to it, there are but few people, and in broken country it gets a practically impregnable hold. So tenacious of life is it, and so adapted to its environment, that it is perhaps impossible to discover a method of destruction which will not destroy the adjacent vegetation at the same time, and the difficulty of the problem is enormously increased by the fact that the sides and tops of hills, gullies, fissured and difficultly accessible country, have to be left as breeding places for the pest.

There are many people who think that national pests of such magnitude can only be adequately coped with when our agricultural and pastoral population is much more dense than it is at present. Meantime, it has been valiantly attacked in many directions, and no efforts should be relaxed. It has been used as a supplementary food in drought times, and doubtless will be again so used in the future; but I have never met a user of this plant as a stock feed who has not emphasised the point that it is a famine food at best, and that he was heartily glad when he could abandon the use of it.

In New South Wales it has obtained a firm hold in the district of the Upper Hunter River and its tributaries, and in the northern districts generally, not ascending to the high tablelands, nor occurring in regions of moderately high rainfall. It is a plant of dryish warm regions, which conserves water contained in vesicles and thickened by mucilage. In Queensland the affected areas are greater even than in New South Wales, and the plant by no means confines itself to poor land, some of the richest farming land being temporarily thrown out of use by its invasion. The growth of this Opuntia is one of the wonders of the world, and the spread of few plants in any country can be compared with it.

The Pest Pear (*Opuntia inermis* var.), near Walgett, N.S.W.

From what I have said, it will be a surprise to most people to learn that this plant is botanically imperfectly known. It is called *Opuntia vulgaris* in the schedule to the Prickly Pear Destruction Act of 1886, 50 Victoria, No. 2; and the name is still held by many people, who are doubtless influenced by the local appropriateness of the name *vulgaris*. But the true *O. vulgaris* of Miller is a very different plant.

The Pest Pear is, in my view, either a form of *O. inermis*, P. DC., or a species closely allied thereto.

A. P. De Candolle's original figure, t. 138 of *Plantes Grasses* (Paris, 1799), is by him labelled "*Cactus opuntia inermis,*" or, in modern nomenclature *O. inermis*, DC. It has no fruits, and since it lacks definiteness, it has caused some discussion.

As regards the absence of spines, from which it obtains its name *inermis*, anyone who knows our pest pear knows that it is often spineless; it is the tiny barbed spinules that are dreaded, not so much the spines.

Names for Opuntias must be in many cases given very cautiously, especially by botanists living in countries where they are not found wild. One of the greatest living authorities on this group of plants wrote to me quite recently in these words:—

> The next two years it will probably be possible for me to furnish recognisable illustrations of species which I *pretend* to know, or better, *think I know*.

[The italics are mine.]

Speaking of a collection of Opuntias sent from Europe to the New York Botanic Garden, Dr. N. L. Britton pertinently remarks:—

> . . . . he (a well-known European botanist) has recently described a number of these prickly pears as species new to science, but in most cases the origin of the plants, thus made particularly interesting, has been lost, and we now have the opportunity of endeavouring to correlate them with wild species in cultivation here. It is suspected, however, that these plants cultivated in the Mediterranean region have changed from their natural characteristics, and that, therefore, such correlation may not be possible. (*Journ. N. York Bot. Gard.*, vii, 170.)

The same remarks are probably true of the Pest Pear of New South Wales and Queensland, which has doubtless been in Australia for more than a century, and, probably, ever since 1788; there has been sufficient lapse of time and altered environment to allow for some departure from the strict type of *O. inermis*, A. P. DC., or whatever the original species may have been.

The Pest Pear is wonderfully uniform over an enormous area in Australia, but I will presently show that it varies somewhat. It is a matter of opinion whether it is a form of *O. inermis* or not (it is certainly not typical for that species). It appears to me to hover round *O. inermis*, but I am very much inclined to think that this pear has, through the influence of time and space, formed a race distinct from that of the American plant (whatever that may be) from which it sprang. I am very much tempted to give it a new name, for the sake of precision, but forbear.

Now let us consider for a moment another form attributed by some to *O. inermis*. This is *O. acrampo*, Phil. Schumann, Gesamtbeschreibung der Kakteen, p. 718, says that, having received specimens of this species (*acrampo*, Phil. *Annal. Univ. Chile*, lxxxv-lxxxvii, 492, 1894), he is satisfied that it is identical with *O. inermis*, P. DC. The berries are locally used for colouring wine.

It is possible that *O. acrampo* may be the true *O. inermis*, but while it agrees with A. P. De Candolle's figure fairly well as regards the joints, it certainly does not do so as regards the buds, while our Pest Pear agrees with the figure as regards the buds, and less so as regards the joints.

I have thought it well to contrast *O. acrampo* (which is thought to be the true *inermis* by some botanists) and our Pest Pear (which I think is a form of *inermis*, or, perhaps, a new species). In the Sydney Botanic Gardens collection, I have labelled the former plant—

(*a*) *O. inermis*, P. DC., var. (*O. acrampo*, Phil.); and the latter plant—

(*b*) *O. inermis*, P. DC., var. ("Pest Pear").

Opuntia acrampo, Phil. ? *Opuntia inermis*, Schumann.	Pest Pear.
Buds.—Blunter than in A. P. DC's figure, t. 138 of *Plantes Grasses*.	Bud like that of A. P. DC.'s figure.
Flowers.—Yellow (sometimes tinted orange)	Lemon-yellow. (Sometimes tinted orange as they pass maturity)
Fruits.—Pear-shaped. Sometimes curved. Size about 1⅞ inch long by 1⅛ inch (approximately). Purple or crimson externally ; flesh crimson. Perhaps bears a greater number of fruits.	Pear-shaped, often curved; size about 2¼ inches long by 1¼ inch (approximately). Purple or crimson externally. Flesh crimson.
Habit.—Has a distinct stem, and is of a spreading habit. Its erect habit largely prevents its rooting by its joints.	Forms a dense growth, with hardly distinct stems. More erect in habit, though, as a rule, a dwarfer plant. Being dwarf, it roots by its joints. Drawn up to the light in brigalow or other timber country, it may attain an exceptional height.
Spines.— Few.	Some plants, say, 1 per cent., are very spinous, but monospinous.
Joints.—Smaller, thicker 18 x 7 cm. (say 7 x 3 inches) average.	24 x 15 cm. (say 9½ x 6 inches) average.
Spinules.—Black, but perhaps not constant.	Yellow, but perhaps not constant.

In the neighbourhood of Rockhampton, Queensland, the Pest Pear appears to be more erect in its habit than in New South Wales ; indeed, there would appear to be two forms—(*a*) the common or Scone form ; (*b*) the *acrampo* form ; and there seems to be evidence that these two forms run into each other.

O. stricta, Haw., is a species which is often quoted as a synonym of *O. inermis*, but the species which is known to us as *O. stricta* is a smaller, more slender plant, say, 3 feet high. It has—

(*a*) Shiny joints, mostly monospined.
(*b*) Blunt buds.
(*c*) Orange flowers.
(*d*) Smaller, more slender fruits.

O. inermis and *O. stricta*, as we know them, are different species.

I offer this contribution to the botany of the Pest Pear in the hope that its precise position may be soon elucidated. It is obvious that this point must be settled before we can state what is the European and American experience of our plant. My conservative statement is the result of correspondence and specific inquiry extending over fifteen years.

Returns from a Wentworth Irrigated Orchard.

W. J. ALLEN, Fruit Expert.

THE following returns for the current year have been supplied by Mr. W. Sage from his orchard and vineyard, planted on box flats in the Wentworth Irrigation Area (now Curlwaa) in September, 1908 :—

Varieties.	No. of trees	Distance apart.	Yield of dried fruit.	Value.
			cwt. qr. lb	£ s. d.
Apricots	362	20 ft x 20 ft.	57 1 16	168 19 1
Peaches	458	20 ft. x 20 ft.	133 2 6	491 8 3
Currants and Sultanas .	1,640	12 ft. x 10 ft.	125 1 1	236 14 8

Bonus on export of apricots has not yet been credited. Large currants with stones and raisins for distilling purposes have not been accounted for yet, and a bonus is usually paid in addition.

In addition to the above, some 2 or 3 tons of fresh fruit were sold or given from this area, and Mr. Sage has now on hand 1½ cwt of dried fruits for home consumption and show purposes.

The figures given, however, total £897 2s.; and the packing-house charges were £87 19s. 2d.; leaving £809 2s. 10d. This makes the returns per acre—

	£ s. d.
Vines	47 6 0
Peaches	93 13 0
Apricots	38 4 0

There would be some difficulty in giving the expenditure, as Mr. Sage and his family have done most of the work. The statement is intended only to show the returns of peaches, apricots, and vines when planted on the best box soil in the Wentworth Irrigation Area.

The whole of these fruits have been delivered at the packing house within three years and seven months from the time the trees were planted. Vines usually give a pretty full crop in their fourth year. This year, however, the crop was impaired by oidium. The peaches and apricots are not yet full crop. There is a promise of a considerable increase on these for next season.

Mr. Sage has a good many navel oranges on his trees, which have not yet been harvested. The fruit is very fine, and will command the highest price in the market.

POULTRY-FEEDING IN OHIO.

IN Circular No. 107 of the Ohio Experiment Station, "A Successful Alfalfa and Truck Farm in South-eastern Ohio," we read :—

> The poultry is a source of considerable income during the winter months, when it is given good care ; but with the coming of summer, everybody gets busy with other work, and the chickens are left to scratch for themselves. From November to May the hens are fed.

In another portion of the Circular, it is remarked that the owner of this farm studies the market, and grows what the other fellow doesn't ; hence his success.

ERADICATING THISTLES.

"RECENTLY I visited Mr. Walter Cameron's Te Ore Ore property, Wairarapa" (writes J. S. Rankin, in the New Zealand *Journal of Agriculture*), "and along with him, inspected eight different patches of Californian thistle, all of which are on deep loamy soil on a river-flat. Three of the patches were treated five years ago with a thick coating of salt. On one of the patches the surface was skimmed of grass, the salt laid, and then covered over with the surface grass again. The other patches, which were not quite so large, were treated in a similar manner three seasons ago. In every case the treatment has been successful. Only on the recently treated patches has Mr. Cameron noticed the thistle appearing, about twenty small weedy plants. These he again treated last season. I myself dug down to a depth of over 2 feet, and nowhere did I come across any thistle. The grass is commencing to grow beautifully on the patches treated five years ago."

FODDERS FOR THE DORRIGO.

MR. W. H. PHILLIPS, J.P., "Highgate Hill," Little Nymboida, East Dorrigo, wrote on 24th May, 1912 :—

> In December last I sowed some lucerne seed on the side of a hill about 250 feet above the river. I have cut the lucerne three times since. Although there has been no rain for two months, the last time I cut it it was 2 feet 6 inches high.
>
> On 16th January I hoed in quarter-acre of Planter's Friend seed. It is now well in head, of a good deep colour, and 9 feet to 10 feet high. Mr. Jack Hamilton, late of Albion Park, South Coast, said it was as fine a sample of Planter as he ever saw, and that it meant a lot to the Dorrigo settlers to know that it would grow so well here. There have been a number of frosts, but it has not been affected as yet. I am leaving some to see how long it will last through the winter.
>
> I also sowed 1 acre of rape ; I have been cutting it now for a fair time, and some of it is fit to cut again. Some of the rape is 3 feet high, and weighs 2¼ lb. Pigs do well on it.

Spraying Apple-trees.

J. HUGHES, "Danzig," Penrose, N.S.W.

THE consumer of the apple seldom realises the trouble and expense which the grower experiences in his efforts to exterminate the many pests which infest his orchard and make his fruit unmarketable. To destroy these pests, many methods have been tried with more or less success. The object of this paper is not to deal with the nature of these diseases, nor with each of the various methods which have been practised with a view to their destruction; but the purpose is to deal with that method which has been, and is being, proved the most effective method, viz., spraying.

Spraying has, to a very great extent, had the desired effect, both in regard to pests infesting the tree itself, of which the woolly aphis, so well known to every orchardist, is undoubtedly the worst; and in regard to those pests which directly affect the fruit, such as the codlin moth, another familiar enemy of the grower.

For Woolly Aphis.

In the case of the aphis, red oil has been used as a spray with good results, and not only is it effective just at the time when it is applied, but another great advantage of using an oil is that it hangs to the tree considerably longer than fluids which contain no grease or fat, in this way keeping the aphides in check for a long time.

The grower may obtain the emulsion ready prepared, and ready to put straight into the spray tank, or he can get the ingredients (red oil and soft soap) separately, and mix them himself. Pamphlets giving full particulars may easily be obtained, dealing with the proportions of the ingredients and the method of mixing. The more hot water is used, the better and the more uniform the mixture will be. Even in cases where the prepared spraying mixture is used, it is advisable to first add as much hot water as possible; then stir well until it is thoroughly mixed, fill the remainder of the tank with cold water, and commence to spray immediately, while the mixture is still warm. If the orchardist is able to have the whole of the water hot, the results obtained will amply repay his extra trouble in so doing. The oil not only mixes better in hot water than in cold, but will remain mixed longer; it is also less likely to rise to the top in hot water, as hot water is lighter than cold.

With regard to oil sprays, it is important to remember that the spraying must take place when the trees are not in leaf, as the oil, combined with the heat of the sun, burns the foliage, and thus kills the tree. The proper times to spray are, firstly, immediately the leaf has fallen, and secondly, just before the tree breaks into bud again. By adhering to this rule, and by destroying every trace of the blight each time, the period during which the aphis remains untouched is limited to the months when the tree is in leaf. There is, of course, plenty of time for another spray between the two just mentioned, and if it is convenient to spray midway between the two, so much the better; but providing that two regular sprays are applied thoroughly, it will be found that the disease will be kept well in check. However, if a few trees are affected more than the majority, which is often the case, it is advisable to give these an extra spraying.

In some orchards, it is the custom to leave the spraying until the pruning is done, in this way having less wood to spray. To pursue this course in small orchards, where the pruning only takes a short time to accomplish, may be very well; but in large orchards, where the pruning takes a considerable length of time, to spray first is preferable, for while the pruning is in progress, the aphides are naturally becoming stronger and more numerous on the wood that is left; and it will be found, I think, that although there is less wood to spray, the disease has attained such a hold on the tree as to necessitate more trouble and expense to eradicate it than would have been necessary before the pruning had been done, when the aphides were weaker.

In colder districts, where frosts are prevalent, it is suggested that the grower spray immediately after a frost, as the aphides must naturally be weakened thereby, and hence the spraying will take better effect.

For Codlin Moth.

As well as being the most effective, spraying is also the most convenient way of fighting the codlin moth. This is proved by the fact that the majority of orchardists, since they have been free to choose between bandaging and spraying, have chosen the latter in preference. As every fruit-grower is aware, the regulations under the Fruit Pests Act, relating to the destruction of the codlin moth, have been amended, and in consequence the orchardist now has the option of bandaging his trees, examining the bandages once every ten days, and killing the grubs which take shelter within them; or of spraying his trees with a solution of arsenate of lead of such a strength and at such periods as are specified in the said regulations.

The first spray must take place when about 90 or 95 per cent. of the blossom has fallen. This is the most important application of the spray, and unless it is done at exactly the right time, the results will be anything but satisfactory. It is injurious to the blossom, which means that it is injurious to the crop, to spray too soon; and if left until the calyx of the flower is closed, the poison cannot enter the recess in which the eggs of the moth are laid, thus making the effect of the solution void, and causing time and labour to be thrown away. The second and third sprayings must take place at periods of three and seven weeks respectively from the time of the first spray.

Lead arsenate for spraying purposes can be obtained in two forms—as a paste and as a powder. Up till last season the paste was generally used, but growers who have tried the powder prefer it to the paste, as it mixes with water more easily. It is also much cheaper, when everything is considered, as a large percentage of the paste is water. Prices and directions for use may be obtained from any of the agents.

As I have stated previously, this method of spraying, instead of bandaging, has proved most satisfactory and effective. Let me quote two cases in which this desirable result has been proved.

In a ten-year-old orchard in this district, the grower, in the fruit season 1910–11, bandaged his trees in fulfilment of the regulations, and sprayed once with lead arsenate, using the paste at the rate of 3 lb. to 40 gallons of water. This took place when about 95 per cent. of the blossom had fallen, and for the whole season it was found that about 20 per cent. of the fruit was destroyed by the moth. In the season 1911–12, the same grower did not bandage at all, but sprayed three times, using the powdered form of the lead, at the rate of 1½ lb. to 40 gallons of water, and found that only about 5 per cent. of his fruit was affected by the moth.

Again, in a full-bearing orchard, also in this district, for the season 1910–11 the grower bandaged and sprayed once, and found that a good percentage of his fruit was mothy, as well as finding a large number of grubs in the bandages. For the season 1911–12, the same trees were sprayed three times in accordance with the method given above, and scarcely a moth-eaten apple was to be found. Two trees only were affected to any extent, these being of the Prince Alfred variety; but the first spraying of these was left rather late, so that it is quite probable that the calyx of the blossom had closed, thus hindering the poison from taking effect. This fact, however, does not depreciate the value of the results obtained by spraying, but rather it causes its satisfactory effects to be more readily seen.

The Motor Spray Pump.

In up-to-date orchards the motor spray pump has taken the place of all previously invented spraying equipments, and the advantages which this has over hand spray pumps are many, and well worthy of remark. A 1 h.-p. motor engine is sufficient to keep up a pressure of 150 lb. to the square inch on two hoses, with three nozzles on each, though from 80 lb. to 100 lb. is quite sufficient. In this way a force is obtained which is greater than one man can raise on one hose and one nozzle, with a hand spray pump. From this fact alone, two advantages are plainly seen—first one man less is needed, the only extra expense being (barring accidents) benzine to the value of about 1s. or 1s. 3d. per day; and second, the immense force with which the fluid leaves the nozzle. If spraying is to be a success, force is essential. In spraying for woolly aphis, it is well known that unless the oil finds its way into the crevices and holes in which the aphides exist, those that remain untouched will soon multiply and cover the tree as thickly as ever again. But it is impossible to reach these crevices without force. The same thing applies to the first spray for the codlin moth—unless the poison reaches the inside of the cup of the blossom, which ultimately becomes the core of the apple, the desired result will not be achieved. This again needs force, and the motor is the ablest thing to supply it.

A uniform pressure is also to be desired, and this, too, the motor spray supplies. By means of a pressure valve, the pressure, which is indicated by a pressure gauge, may be fixed and altered at the will of the orchardist. When spraying with the hand pump the force is by no means constant, and it often happens that just at the time when the pressure is low, a greater force is needed —*e.g.*, when spraying the top of a high tree, or when spraying into a deep crevice in the bark, where diseases are very likely to be, it is necessary to have greater force than when spraying the lower branches or directly on to the tree; hence the advantage of a uniform high pressure.

All solutions or emulsions should be free from dirt or leaves, or anything that is likely to choke any part of the pump or nozzles, and thus cause a delay. This is especially necessary when using the motor spray, as there are so many fixings into which such a great force may drive any bits of dirt, leaves, &c.

When spraying with red oil, as I have mentioned before, it is found to be much more satisfactory if the tank is emptied as quickly as possible while the mixture is warm. In this respect, also, the motor spray is the more useful, as it is a very much quicker process with the motor than with the hand pump.

The number of trees that can be sprayed per day depends, of course, upon their size, and upon the facilities with which the tank may be filled, and it would not be easy to state a definite proportion between the number of trees sprayed with the two types of machines; but judging from the little experience that I myself have had in the workings of these two kinds of pumps, I should say that at least three times as much work can be done with the motor spray pump as with the hand spray pump in the same time.

LIST OF FERTILISERS IN NEW SOUTH WALES.

1912 LIST.

In the List of Fertilisers which appeared in the *Gazette* for July, 1912, owing to a slight misapprehension in the basis of calculation, a number of the values given were incorrect. The tables on pages 585 and 586 of the July issue are therefore repeated, with the necessary corrections. Readers are requested to substitute these tables for those previously published.

II.—BONE AND BLOOD MANURES.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.		
		Nitrogen.	Equivalent to Ammonia.	Phosphoric Acid.	Equivalent to Tricalcic Phosphate.	£	s.	d.
Special fertiliser, No. 3	Co-operative Wholesale Society, Alexandria	5·0	6·07	18·0	39·29	6	4	9
Bone-dust, B.D.1	Paton, Burns, & Co., 75 York-street	3·7	4·5	22·12	48·22	6	0	11
,, B.D.2	,, ,, ,,	3·7	4·5	22·12	48·22	6	0	11
,, B.D.3	,, ,, ,,	3·3	4·0	20·70	45·0	5	10	8
,, B.D.4	,, ,, ,,	3·3	4·0	18·4	40·0	5	4	10
Bone and blood, B.B.1	,, ,, ,,	5·7	6·5	18·0	39·29	6	19	5
,, ,, B.B.2	,, ,, ,,	5·1	6·0	12·0	26·16	5	12	9
Bone and blood manure	R. S. Lamb & Co., 55 Pitt-street	5·76	7·0	13·74	30 0	6	7	11
A 1 bone-dust...	,, ,, ,,	3·7	4 5	21·98	48·0	6	0	7
*** bone-dust	,, ,, ,,	3·91	4 75	22·9	50·0	6	6	5
Vulture manure	,, ,, ,,	3·29	4 0	18·32	40·0	4	13	7
Blood and bone manure	Silvester Bros., Regent-street, Redfern	3·99	4·84	21·98	48·0	6	5	0
Raw or green bone-dust	A. Wooster, Epping	4·01	4 86	24·41	53·3	6	12	4
Blood and bone-dust ..	,, ,,	5 76	7·0	13·74	30·0	6	7	11
Pure steamed bone-dust	,, ,,	3·91	4·75	24·5	53·5	6	1	1
Blood and bone manure	Farmers' Fertilisers Corporation, Ltd , 2 Bridge street.	5 5	6·67	18 0	39·29	6	17	4
Bone-dust	,, ,, ,, ,,	4·25	5·16	21·85	47·7	6	8	6
,,	I. Tester, O'Riordan road, Alexandria	3 7	4 5	21·98	48 0	6	0	7
White bone-dust	Sydney Soap and Candle Co , Ltd , 365 Kent-street	3·5	4·25	27·00	58·86	5	17	9
Blood and bone manure	,, ,, ,,	5·0	6·07	17·0	37·06	6	5	10
Bone and blood manure	J. Cooke & Co., Sandown, Granville	6·85	8·32	10·44	22·82	7	4	7
,, ,, ,,	Jas. Barnes, Granville South	5·21	6 32	15·74	34·36	6	5	4
Blood	B. Richards and Sons, Ltd., Riverstone	13·75	16·0	....	....	10	9	8
Bone-dust	M. Gearin, Gardener's-road, Botany	3·7	4·5	23·47	51·29	6	4	10

III.—SUPERPHOSPHATES, MIXED FERTILISERS, AND IMPORTED FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.				Manurial Value.		
		Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	£	s.	d.
Superphosphate No. 1, 36–38 %	George Shirley, Limited, 279 George-street	....	17·0	17.0	....	4	3	7
,, No. 2	,, ,,	1·6	15·0	15·0	1·	5	3	9
,, No. 3	,, ,,	3·3	13·0	13·0	2·	6	5	5
,, No. 5	,, ,,	3·3	12·0	12·0	7·	7	8	5
,, No. 7	,, ,,	1·6	11·4	11·4	1·	4	6	0
,, No. 9	,, ,,	4·1	6·5	6·5	4·	5	16	10
,, No. 11	,, ,,	....	11·4	11·4	7·	4	15	2
,, No. 12	,, ,,	3·3	5·5	14·7	2·	5	15	4
,, No. 14	,, ,,	2·5	5·5	14·2	6·	6	4	1
,, No. 18	,, ,,	....	5·5	14·2	6·	4	6	0
,, No. 19	,, ,,	4·1	4·1	11·4	2·	5	15	3
Bone phosphate A	,, ,,	·5	....	29·8	....	4	14	8
,, ,, M	,, ,,	1·6	....	16·0	1·	3	16	8
,, ,, N	,, ,,	1·6	....	16·0	4·	4	13	6
,, ,, O	,, ,,	2·5	....	13·7	6·	5	11	6
No. 1 Superphosphate	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-st.	....	17·0	18·0	....	4	6	4
A1 ,,	,, ,, ,,	....	20·5	21·5	....	5	4	0
Nitro-superphosphate	,, ,, ,,	1·35	15·44	19·05	....	5	6	5
Bone superphosphate	,, ,, ,,	1·5	9·0	20·5	....	5	1	4
Marion Guano	,, ,, ,,	....	....	31·0	....	4	5	3
No. 6. Potato Fertiliser	A. Wooster, Epping	4·52*	....	14·91	5·	7	0	4
No. 7. Complete Fertiliser	,, ,,	5·01†	....	14·56	2·	6	10	0
Superphosphate	Paton, Burns, & Co., 75 York street	....	17·0	17·0	....	4	3	7
Complete Mixed Manures, P.B.1	,, ,,	4·3	4·25	9·75	5·	6	9	6
,, ,, P.B.2	,, ,,	3·75	4·25	9·75	7·1	6	12	8
,, ,, P.B.3	,, ,,	3·4	5·10	9·0	7·1	6	7	4
,, ,, P.B.4	,, ,,	3·3	2·75	9·65	7·1	6	2	6
,, ,, P.B.5	,, ,,	4·3	4·25	9·75	2·4	5	15	0
,, ,, P.B.6	,, ,,	3·3	6·0	12·68	2·4	5	11	6
,, ,, P.B.7	,, ,,	1·7	6·8	13·47	1·2	4	4	5
,, ,, P.B.8	,, ,,	·82	8·5	10·80	7·1	5	0	3
,, ,, P.B.9	,, ,,	2·47	....	9·0	4·9	4	9	9
,, ,, P.B.10	,, ,,	2·47	....	10·5	4·9	4	13	10
,, ,, P.B.11	,, ,,	2·47	....	10·5	2·4	4	0	0
,, ,, P.B.12	,, ,,	1·6	....	14·9	·6	3	8	9
,, ,, P.B.13	,, ,,	....	....	12·0	7·1	3	12	8

* ·75 Ammoniacal. † 1·20 Ammoniacal.

CHLOROSIS OF APPLE LEAVES.

A FRUIT-GROWER recently submitted some apple leaves which had lost colour without any apparent cause, and stated that 150 out of 300 trees were so affected. The Bureau of Microbiology supplied the following report:—

The trouble is what is known as "Chlorosis," the leaves appearing yellow owing to the disappearance of Chlorophyll, or green colouring matter. In some instances the whole leaf may be affected; in others, the yellowing appears only in patches. Owing to the failure of the leaves in performing their proper functions, the fruit may fail to develop. The exact cause is not known, but usually attention must be given to the soil. The application of sulphate of iron is usually beneficial. This may be placed on the ground around each tree, about ¼ lb. to a tree, or the trees watered with a solution of a strength from 5 to 10 per cent. Spraying the trees with 1 per cent. of iron sulphate is sometimes effective.

PHOSPHORIC ACID AND HUMUS.

ACID-SOLUBLE phosphoric acid has been found in general to vary directly as humus content. It would seem that in every part of the State this holds true. Hence humus must be regarded as a retainer of phosphoric acid in an available form. This is of importance, as indicating the necessity of keeping up the supply of organic matter in soils that are manured with superphosphate.—H. I. JENSEN, D.Sc.

CORRECTIVES FOR PIGS.

"EVERY stockman who has kept pigs in confinement has observed their strange craving for seemingly unnatural substances. . . . . The feeder would best supply what the pig craves in this direction, and search for explanations later if he wishes."—PROFESSOR HENRY.

The Manager of Cowra Experiment Farm has placed in the piggery a trough divided into six sections, which are kept filled respectively with (1) ashes; (2) bone-dust; (3) charcoal; (4) lime; (5) ground phosphate; (6) salt. A frame shelter protects the trough from rain, but the pigs have free access to it. It is found that most salt is consumed, then lime.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

HARROWING SOWN LAND.—"G.T." (Inverell) asks whether, in the event of rain falling after oats or wheat has been planted in dry ground, would it injure the grain to harrow before it comes up, so as to conserve moisture.

At this time of the year there is not the necessity to break the soil up that there is in the summer, and therefore unless it can be safely done, it is not wise to harrow until the crop is well up.—GEO. VALDER.

MOLASSES FOR STUD STOCK.—"R.H.B." asks whether molasses is a suitable food to give to bulls or rams during stud season or to females about to go to the stud.

Molasses is an excellent food, provided too much is not given. The amount which a bull should receive daily should not exceed 2 lb., and a ram about ½ to ⅔ lb. It is best given mixed with water, and sprinkled over the chaff. VETERINARY OFFICERS.

IDENTIFICATION OF BIRD.—"E.S." (Willowtree): From the description and feather, I think this is the Warty-faced Honeyeater (*Meliphaga phrygia*). It is one of the handsomest of our honeyeaters, common in open eucalyptus forests or along river banks. Though like all the honeyeaters it eats insects, it has the honey tongue of the *Meliphagidæ*.—W. W. FROGGATT.

CLARIFYING SOAP-SUDS.—"F.G.W." asks whether soap-suds which have been clarified with lime can be softened so that they may be used again for washing. He has to draw water three-quarters of a mile for washing purposes.

The only suggestion I can make is that you might try the addition of carbonate of soda (or washing soda). If this is added to the water containing lime, a considerable proportion of the lime will be thrown down, and the water decanted from the precipitate will give a good lather with soap.

A better substance than lime for clarifying the dirty water originally is Ferric Chloride (perchloride of iron). If the water is clarified with this substance, the addition of carbonate of soda removes the iron completely, and the result is a water giving a good lather with soap. One lb. of Ferric Chloride should be sufficient to clarify 1,500 gallons of soapy water.—F. B. GUTHRIE.

COWPEAS.—"P.J.C." (Bowral): The cowpea is largely used for grazing off with sheep. As a rule it is very safe fodder to use, but care should be taken in putting sheep on it which are in poor condition, as there is a risk of their becoming blown. Cowpea is also valuable for using as a soiling plant, *i.e.*, cutting it and feeding it to stock in the green state. It makes excellent silage, especially if mixed with other fodders such as maize and sorghum, and can be made into hay of good quality.—GEO. VALDER.

STOCK DISEASES.—"J.K." (Coolamon): It is not possible to fully explain the application of the tuberculin test, inoculation against anthrax, blackleg and pleuro-pneumonia, through the medium of the *Agricultural Gazette*. Moreover, only men approved of by the Chief Inspector of Stock are allowed to inoculate against anthrax and blackleg, for which a license is required.

JERSEY CATTLE.—"A. C. McL.": Yes, a pure-bred Jersey bull may have white spots.—M. A. O'CALLAGHAN.

PISÉ FOR SILOS.—"C. B.": A pisé silo, as suggested by you, would be a failure; no matter how well reinforced, it would not be strong enough to stand the first packing of the silage. The proposed size is also not to be recommended. Nearly all silos of less than 100 tons capacity are more or less failures. The smallest to be recommended is 25 feet high and 16 feet in diameter, either round or octagonal on plan.—A. BROOKS.

CLEARING WITH EXPLOSIVES.—"J.W." (Gunnedah): The pamphlet forwarded gives full instructions regarding the destruction of trees and stumps with explosives. If there are any further particulars which you require the Department will be glad to obtain them for you.—GEO. VALDER.

EXPLOSIVES FOR PREPARING ORCHARDS.—"L.S.": Very little work has been done in this country in connection with the use of dynamite for preparing land for planting orchards, but it is claimed in America that this method has been very successful, and we are now making trials in this direction. In cases where the subsoil is a hard one, we consider that there is a good prospect of its success. From time to time as we carry out experiments, the results will be published in the *Agricultural Gazette*.—GEO. VALDER.

Harrowing Growing Wheat.—"H.E.H." (Craboon): The wheat should be allowed to get well above the ground before harrowing. Generally, the best time appears to be when it is from 4 to 6 inches high. Choose a time when the clods break easily, but take care that the ground is not too wet, otherwise it will puddle.—Geo. Valder.

Horse with Corns.—"T.R.C.": In treating a bad case of corns, such as that described, the horse requires resting. The sole of the hoof should be pared down over the seat of corn until the soft structures below are almost but not quite reached The shoes should be fitted fairly wide at the heels, and when the horse is again worked a leather sole should be used, fixed between the shoe and the hoof.—Veterinary Officers.

Weeds in Apiaries.—"E.W.": The weeds should be sprayed with a solution of arsenite of soda in the proportion of 1 lb. of the chemical to 4 gallons of water. Care should be taken in using the mixture to prevent stock from grazing on the land until after the first heavy fall of rain. With regard to your suggestion to clear away weeds and then put down 6 inches of stone, you would probably find that where there was no traffic the weeds would grow through.—Geo. Valder.

Feeding Brood Mares on Chaff.—"F.C.R": An exclusive ration of chaff is a very bad one for pregnant mares, and frequently results in intestinal troubles to the foals when born. It is also likely to cause colic and impaction of the intestines in the mares, which may result in abortion. If you have to use chaff almost exclusively, give a bran mash every second day to keep the bowels loose, and also mix 2 oz. of crushed salt on the chaff daily.—Veterinary Officers.

Destroying Couch Grass.

A correspondent recently asked how to destroy couch grass on land proposed to be sown with lucerne. The best method is to plough the ground up in winter and expose the roots to frosts, or plough it up in summer and expose them to heat. Another method is to plough lightly and then harrow or rake (with a hay rake) the roots together into heaps and burn them. Of course, in small areas, where a plough cannot be used, hoeing is adopted.—George Valder.

FOR SALE.

Berkshire Boars - - £2 2s. to £4 4s.

Berkshire Sows - - £2 2s. to £3 3s.

Apply—The MANAGER,
Experiment Farm,
Bomen.

Orchard Notes.

W. J. ALLEN.

AUGUST.

WINTER spraying should be commenced with the lime-sulphur solution, which is both an insecticide and a fungicide. Keep a sharp outlook for aphis on peach-trees. Resin and washing soda, tobacco-wash or Nikoteen will be found useful to keep this pest in check. Also keep a sharp lookout for the appearance of woolly aphis and mussel scale, and should any trees be found affected they should be carefully pruned, removing and burning as many of the infested twigs as possible. Spray thoroughly with red oil emulsion.

Keep all fruit-houses as clean as possible, as there is no doubt they are responsible for harbouring a great many moths every year.

Growers who intend using quick-acting fertilisers should make the first application this month. It is better not to apply too much at one time, but rather make two applications—one now, and one after the fruit is set. In the drier districts, where late rains are uncertain, it is better to make the application earlier than late, as it is well known that they do not give the same results if applied when the soil is at all dry.

The latter part of this month is a good time to start the grafting of deciduous nursery stock, and should there be any unprofitable apple, pear, or other trees standing in the orchard, these also may be grafted to good varieties.

It is surprising how few orchardists grow table grapes even for their own use. There is nothing more refreshing in the summer-time than a bunch of grapes, and every orchard should contain a small plot. The best varieties to grow in a cool district are as follow :—*White:* Royal Muscadine, Golden Chasselas, and Ferdinand de Lesseps ; *Black :* Black Hamburg, Black Champion, Blue Imperial, and Muscat Hamburg.

Green manures should be ploughed under, so that the plant-food locked up in them may be available when the tree requires it to mature its fruit. If the green crop is left too late, moisture, which can ill be spared if the summer is a dry one, is pumped out. Plant young citrus trees.

Concentrated Lime-Sulphur Solution.

The concentrated lime-sulphur solution for the treatment of fungus diseases in pome and stone fruits is rapidly taking the place of Bordeaux mixture in the United States. It has been found that arsenate of lead may be added to the lime-sulphur solution with advantage.

The following formula is given in Bulletin No. 330 of the New York Agricultural Experiment Station :—

Lump lime	Pure CaO	36 lb.
	or	
	95 per cent. CaO	38 ,,
	or	
	90 per cent. CaO	40 ,,
Sulphur ..		80 ,,
Water ...		50 gallons.

This solution is stored, and diluted with water according to the purpose for which it is required. Growers interested should write to "The New York Agricultural Experiment Station, Geneva, N.Y., U.S A." for a copy of Bulletin No. 330.

FRUITS FOR TEMORA DISTRICT.

A CORRESPONDENT in the Temora district having asked for advice as to the best varieties of fruits to plant, the following recommendations may be found of value to others also :—

Apples: Arkansas Black, Missouri, Pippin, Statesman, Granny Smith, Prother's Winter, Wealthy.

Pears: Bartlett, Packham's Triumph, Josephine de Malines.

Peaches: Elberta, California Cling, McDevitt's Late Cling.

Plums: Angelina Burdett, Giant Prune, Cyca Sonomo.

Apricots: Ouillin's Early Peach, Alsace, Hemskirke.

Almonds: Paper Shell, Ne Plus Ultra, Riverside Peerless.

Quince: Portugal.

Loquat: Mammoth.

Grapes: Mrs. Pince's Black Muscat, Lady Down's Seedling, Black Champion, Waltham Cross, Doradillo, Black Cornichon, Daria.—W. J. ALLEN.

EARLY TOMATOES AT HAWKESBURY AGRICULTURAL COLLEGE.

SINCE the publication of Mr. Alford's article on this subject in July *Gazette*, the College authorities have received a large number of applications for seed of Spark's Earliana Tomato. The Principal wishes to inform the public that the College does not supply seed of tomatoes, but that it should be purchased from one of the leading Sydney seedsmen.

Agricultural Bureau of New South Wales.

(NOTES COMPILED BY E. HARRIS.)

Branch.	Honorary Secretary.
Bathurst	Mr. J. McIntyre, Orton Park.
Bonville	Mr. H. B. Faviell, Bonville.
Cardiff	Mr D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coreen-Burraja	Mr. H. Vickers, Coreen.
Cowra	Mr. E. P. Todhunter, Cowra.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr G. E. Alexander, Dunedoo.
Forest Creek	Mr W. Thompson, Forest Creek, Frogmore.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald. Keepit.
Kellyville	Mr. T. Glasgow, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S Stening, Little Plain, *via* Inverell.
Lower Lawrence	Mr. E T. Cooney, Lawrence
Lower Portland	Mr. G. Gosper, Lower Portland.
Mangrove Mountain	Mr. G. T. Hunt, Mangrove Mountain
Milbrulong	Mr. O. Ludwig, Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *via* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, Penrose.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's
Sackville	Mr. C H. Britten, Sackville
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wolseley Park	Mr. K. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a précis of any paper which may have been read and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Lectures and Demonstrations.

A number of lectures on veterinary subjects to be given by the Veterinary Surgeons of the Department, and demonstrations on pruning and grafting, with information on winter spraying, by Mr. J. G. R. Bryant, Assistant Fruit Expert, have been arranged as follows:—

Veterinary Lectures:

Cowra, 7th August.
Inverell, 9th August
Yass, 20th September.

Orchard Demonstrations

Inverell, 5th August.
Little Plain, 6th August.
Parkes, 13th August.
Mangrove Mountain, 21st August.
Wallendbeen, 26th August.

Bonville.

On the 17th July, in the local School of Arts, Mr. Inspector G. Marks lectured on "Agricultural Experiments."

Cardiff.

At a recent meeting of the branch, the subject under consideration was "Sprays and their Effect on Fruit Trees." The experience of several members with red oil on peach trees had been rather unfortunate, and considerable damage has been done to the trees.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a demonstration on "Pruning, &c.," on the 25th June.

Carlingford.

At the meeting held on the 30th May at the Public School, Carlingford, a discussion took place on "Winter Spraying of Fruit Trees." Leaflets dealing with the matter, which had been furnished by the Department, were distributed to the members.

Mr W. G. Smith, one of the members, has most generously placed a powerful microscope at the service of the branch.

Cowra.

Mr. Veterinary Surgeon Sanderson will lecture to the members in the afternoon of the 7th August on "Strangles, Influenza, and Tetanus in Horses."

Mr. D. McLaren has been elected Chairman of the branch; Mr. W. Bill, Hon. Treasurer; and Mr. E. P. Todhunter, Hon. Secretary.

Forest Creek.

The Sheep and Wool Expert will visit this branch on the 15th August.

Gunning.

The Sheep and Wool Expert visited the branch on 18th July, and by the aid of suitable classes of wool gave a practical demonstration on the most profitable wool to grow. This demonstration was supplemented with the practical handling of clips, special attention being paid to those of the smaller growers. During the evening of the same day a lecture was given, illustrated by lantern views, showing the merits of different classes of sheep, and the results of experiments conducted by the Department with breeds were fully explained.

On 24th July, Mr. J. G. R. Bryant, the Assistant Fruit Expert, gave a practical pruning demonstration in a local orchard.

Lower Lawrence.

At a meeting of the branch held on the 28th May a discussion took place upon the subject "Co-operation *v.* Private Enterprise." It was generally considered that a system of co operation would be greatly in the interests of the producers, and a wish was expressed that the matter be properly organised. A paper was read by Mr. A. Rayner on "Poultry Farming," when a good deal of useful information was imparted to the members.

Katoomba.

There was an attendance of about thirty members at the pruning demonstration given by Mr. J. G. R. Bryant, Assistant Fruit Expert, on 2nd July. Much interest was taken in the methods shown, and information was freely asked for and given.

Messrs. W. Kühn, H. Ives, E. Y. Langton, and T. Lanfranchi have joined the branch.

The branch has been in communication with other branches of the Bureau in connection with the proposed amendments in the "Vine and Vegetation Diseases Act" and the "Fruit Cases Bill."

Lower Portland.

At a public meeting held at the School of Arts on the 6th instant it was decided to form a branch of the Agricultural Bureau, and the following officers were elected:—Chairman, Mr. R. Lowe; Hon. Treasurer, Mr. T. Herps; and Hon. Secretary, Mr. G. Gosper.

Nelson's Plains.

Arrangements are being made for a lecture on "Fruit Culture and Preserving" in September.

Orchard Hills.

The first annual meeting of the branch was held on the 27th June. The election of the officers for the ensuing year resulted as follows:—Chairman, Mr. R. Rankin; Vice-chairmen, Messrs. Bloomfield and J. Hollier, sen.; Hon. Treasurer, Mr. J. Dickson; Hon. Secretary, Mr. H. Basedow. There are twenty-two financial members, and it is fully anticipated this number will soon be increased, when the orchardists and poultry keepers in the district realise the value of the practical work the branch is doing.

On the 1st July, a practical demonstration in pruning grape vines was given by the Hon. Secretary, Mr. H. Basedow, in a local vineyard. There was a fair attendance. In the evening of the same day Mr. G. Bradshaw, of the Department of Agriculture, gave a lantern lecture on "Egg Production and General Management of Poultry." The room was filled with an interested audience, and many valuable hints on the subject were given.

The Assistant Fruit Expert, Mr. J. G. R. Bryant, gave an orchard demonstration in Mr Bloomfield's orchard on 20th June. There were over fifty adults present, as well as a number of the elder school children.

Parkes.

Mr. Veterinary Surgeon Sanderson, M.R.C.V.S., delivered a lecture in the Masonic Hall on the 13th June, on the "Treatment of Wounds and Colic."

On the 13th August, Mr. J. G. R. Bryant, Assistant Fruit Expert, will give a practical demonstration on pruning, &c., at Mr. Cunich's orchard.

Tallawang.

The following is the treatment advised by the veterinary officers of the Stock Branch in cases where horses experience digestive troubles through being turned on green maize stalks to feed :—

Give a pint of raw linseed oil, followed by doses of carbonate of bismuth and bicarbonate of soda, twice daily for a week. The dose of bismuth carbonate is 2 drams, and bicarbonate of soda 1 ounce by weight. The bicarbonate of soda can be given dissolved in the drinking water, but the bismuth carbonate should be mixed with a little treacle and smeared on the tongue. Cornstalks are apt to set up digestive derangement.

Treatment is also advised for worms in horses (caused through running on rough and sour country), as follows :—

The best general remedy for worms in horses is to give 1 ounce by weight of powdered areca nut and 2 drams by weight of powdered sulphate of iron daily for six days. The drugs should be given in a small feed of damp bran one hour before the ordinary morning feed, and the horses should not be allowed to graze at night. On the seventh day give each horse a pint of raw linseed oil.

Toronto.

Messrs. M. Kroose and A. Flintoff have joined this branch.

Walla Walla.

The Hon. Secretary reports that the Assistant Fruit Expert's pruning demonstration on the 9th July was a great success. Farmers attended from all parts of the district, fully seventy being present. Mr. Bryant's practical way of demonstrating was highly appreciated.

Mr. J. W. Mathews, Sheep and Wool Expert, will visit the district on the 29th August, and will give a demonstration in the afternoon, and a lecture in the evening.

Walli.

On the 22nd June, a magic lantern entertainment was given on "The Holy Land." There was from sixty to seventy members and friends present. Later on in the evening a dance was held It is the intention of this branch to have an entertainment night once a month, between business nights, during the winter ; and this arrangement is meeting with much encouragement.

Wolseley Park.

A branch of the Bureau has been formed at this place with a membership of forty-two. The annual fee has been fixed at 1s., and the following office-bearers have been elected :—Chairman, Mr. A. C. Evans ; Vice-chairman, Mr. L. M. Evans ; Hon. Secretary and Treasurer, Mr. Hugh McEachern, of Wolseley Park. The regular meetings have been fixed for 20th July, 17th August, 14th September, 12th October, 9th November, and 7th December.

Yass.

Mr. Veterinary Surgeon Palgrave will lecture on "Strangles, Influenza, and Tetanus in Horses" on the 20th September.

PEA SPOT (*Ascochyta pisi*, Lib.)

A SPECIMEN of a sweet pea plant was recently submitted to the Department, affected by this fungus disease. The Bureau of Microbiology reports :—

The disease attacks cultivated peas, haricot, and French beans, and other members of the pea family. By means of minute black bodies, called "perethicia," which contain numerous minute spores, the disease is rapidly spread, and the fungus on the pods invades the seed. The disease is thus transmitted to fresh stock and to other countries.

Bordeaux mixture may check the spread of the disease if applied in the early stages, but the safest plan is to discard the seed from such infested stock.

Department of Agriculture,
Sydney, *2nd* *August,* 1912.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORN.—Duke of Hampton: sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

GUERNSEYS.—King John: sire, King of the Roses (imp.); dam, Saucy Rose; calved 29th August, 1911; colour, lemon and white. Price, **£50.**

Saucy Rose is by Calm Prince from Rose Petal; she yielded 5,298 lb. milk with an average test of 5 per cent. butter-fat, or a butter production of 311 lb.

Belfast: sire, King of the Roses (imp.); dam, Flaxy 2nd; calved 20th September, 1911; colour, lemon and white. Price, **£40.**

Flaxy 2nd is by Rose Prince (imp.) from Flaxy (imp.). Flaxy (imp.) in thirty-seven weeks gave 6,443 lb. of milk, which it is estimated produced 334 lb. of butter. Flaxy 2nd developed a habit of sucking herself, and the only record shows 3,333 lb. of milk, testing 5 per cent.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Beaucaire's Baby: sire, Monsieur Beaucaire; dam, Rosey of Wollongbar; calved 28th March, 1911. Price, **£40.**

Confidence: sire, Royal Preel, by Itchen Preel from Hayes' Lily du Preel (imp.); dam, Faith, by Prince Souvia from Clatford Hopeful (imp.); calved 30th April, 1911. Price, **£45.**

HOLSTEIN HEIFERS FOR SALE,

WOLLONGBAR EXPERIMENT FARM.

Name	No.	Sire.	Dam.	Calved.	Price.
					£
Folkeen	135	Hollander	Folkje (imp.) .	18 May, 1908 ...	25
Douwe Margy .. .	225	President Douwe ..	Marjaric	18 Nov., 1909 ..	25
Gold	209	,, ,,	Marigold	30 Nov., 1909 .	25
Obedience	247	Obbe 2nd	Lady Hague ..	9 Aug., 1910 ...	20
Magdeburg	304	De Wet	Lolkje Amster ..	25 Aug., 1911 ...	15
Hamburg	305	,, ...	,, ,, ...	25 Aug., 1911 ...	15
Madelein	308	,, ...	Marjaric	9 Aug., 1911 ...	15

H. C. L. ANDERSON, Under Secretary.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	....	....	Berry	*
Shorthorn	Pansy's Progress	Dora's Boy	Pansy 4th (im.)	Wollongbar Farm	*
,,	Imperialist	Florio	Lady Nancy of Minembah.	,, ,,	*
,,	March Pansy	Earl March	Australian Pansy	Grafton Farm	*
,,	Royal Pansy	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm	*
,,	Thessalian II.	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,,	Bridegroom	Best Man	Golden Omelette	Yanco Farm	*
,,	Jamaica Jack	Sir Jack	Rum Omelette (imp.).	Wollongbar Farm	*
,,	Royal Blood	Berry Melbourne	Calceolus	,, ,,	*
,,	Xmas Fox (imp.)	Silver Fox	Malvoisie	Berry Farm	*
,,	Kaid of Khartoum	Sir Jack	Egyptian Belle	Cowra Farm	*
Guernsey	The King's Mirror	Calm Prince	Vivid (imp.)	Swan Bay	11 Dec., '12.
,,	Star Prince	Calm Prince	Vivid (imp.)	Kyogle	1 Feb., '13.
,,	Sky Pilot	Prince Souvia	Parson's Red Rose (imp.).	Maclean	15 Jan., '13.
,,	Prince Souvia	Vivid's Prince	Souvenir (imp.)	Grafton	1 April, '13.
,,	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	H.A. College, Richmond	*
,,	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '12.
,,	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,,	Claudius	Golden Star II.	Claudia's Pride (imp.).	Tweed River	12 Aug., '12.
,,	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes	Berry Farm	*
,,	Good-bye	Western Duke	Souvenir (imp.)	Rous Mill	1 Nov., '12.
,,	Calm Prince	Rose Prince (im.)	Gentle (imp.).	Berry Farm	*
,,	The Peacemaker	Calm Prince	Rose Petersen	Jones' Island	1 Dec., '12.
,,	King of the Roses	Hayes' King	Rosey 8th (im.)	Rookwood Asylum	23 Oct., '12.
,,	Lauderlad	Laura's Boy	Souvenir of Wollongbar	Lismore	3 Jan., '13.
,,	Royal Preel	Itchen Royal	Hayes' Lily du Preel (imp.).	Murwillumbah	10 Nov., '12.
Ayrshire	Jamie's Heir	Jamie of Oakbank	Miss Prim	Wollongbar Farm.	*
,,	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose	Grafton Farm	*
,,	Orphan Boy	Songster of Greystanes.	Rosamond	Glen Innes Farm	*
,,	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Saugie	H.A. College, Richmond	*
Kerry	Kildare II	Kildare (imp.)	Belvedere Bratha 3rd (imp.).	,, ,,	*
,,	Bratha's Boy	Aicme Chin (imp.)	Bratha 4th	,, ,,	*
,,	Rising Sun	Bratha's Boy	Dawn	Bathurst Farm	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1912.

Society.	Secretary.	Date.
Narrandera P. and A. Association	W. T. Lynch	Aug. 6, 7
Trundle P. and A. Association	L. Todd	,, 8, 9
National A. and I. Ass. of Queensland (Brisbane)	C. A. Arvier	,, 12–17
Coolamon A. and P. Association	E. Owen	,, 13, 14
Forbes P., A., and H. Association	J. H. Bates	,, 13, 14
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 20, 21, 22
Parkes P., A., and H. Association	G. W. Seaborn	,, 21, 22
Corowa P., A., and H. Society	J. D. Fraser	,, 27, 28
Ariah Park P., A., H., and I. Association	J. N. Taylor	Sept. 3, 4
Manildra P. and A. Association	C. M. Podmore	,, 4
Grenfell P., A., H., and I. Association	Geo. Cousins	,, 4, 5
Germanton P., A., and H. Society	J. S. Stewart	,, 4, 5
Albury and Border P., A., and H. Society	W. I. Johnson	,, 10, 11, 12
Young P. and A. Association	G. S. Whiteman	,, 10, 11, 12
Cootamundra A., P., H., and I. Association	T. Williams	,, 17, 18
Cowra P., A., and H. Association	W. T. Fisher	,, 17, 18
Canowindra P., A., and H. Association	G. Newman	,, 24, 25
Ganmain A. and P. Association	J. F. Ashwood	,, 24, 25
Henty P. and A. Society	H. L. Yates	,, 24, 25
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25
Temora P. and A. Association	W. H. Byrnes	,, 24, 25, 26
Wellington A., P., and H. Association	A. E. Rotton	,, 25, 26
Burrowa P. A. and H. Society	W. Burns	,, 26, 27
Millthorpe P. and A. Association	R. H. French	Oct. 1, 2
Hillston P. and A. Association	S. J. Gordon	,, 16
Lismore A. and I. Society	T. M. Hewitt	Nov. 6, 7, 8
Tweed River A. Society	A. E. Budd	,, 13, 14
Mullumbimby A. Society	W. O. Davis	,, 27, 28

1913.

Albion Park A., H., and I. Association	M. A. Brown	Jan. 15, 16
Wollongong A., H., and I. Association	M. A. O'Donnell	,, 30, 31, Feb 1.
Berry A. Association	C. W. Osborne	Feb. 5, 6
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 12, 13
Guyra P., A., and H. Association	P. N. Stevenson	,, 18, 19, 20
Central Cumberland A. and H. Association	H. A. Best	,, 21, 22
Dapto A. and H. Society	J. H. Lindsay	,, 25, 26
Northern A. Association (Singleton)	E. J. Dann	,, 27, 28, Mar. 1.
Wyong A. Association	J. H. Kay	,, 27, 28, Mar. 1.
Southern New England P. and A. Association, Uralla.	W. McCrossin	Mar. 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 4, 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Camden A., H., and I. Society	A. Thompson	,, 5, 6, 7
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge	,, 11, 12, 13
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12, 13
Gundagai A. Society	A. Elworthy.	,, 18, 19
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 26, 27
Bathurst A., H., and P. Association	J. Bain	April 2, 3, 4
Hunter River A. and H. Association	E. H. Fountain	,, 2–5
Cobar P. and A. Association	D. H. Dunlop	,, 5, 6
Clarence P. and A. Society (Grafton)	G. N. Small	,, 9, 10, 11

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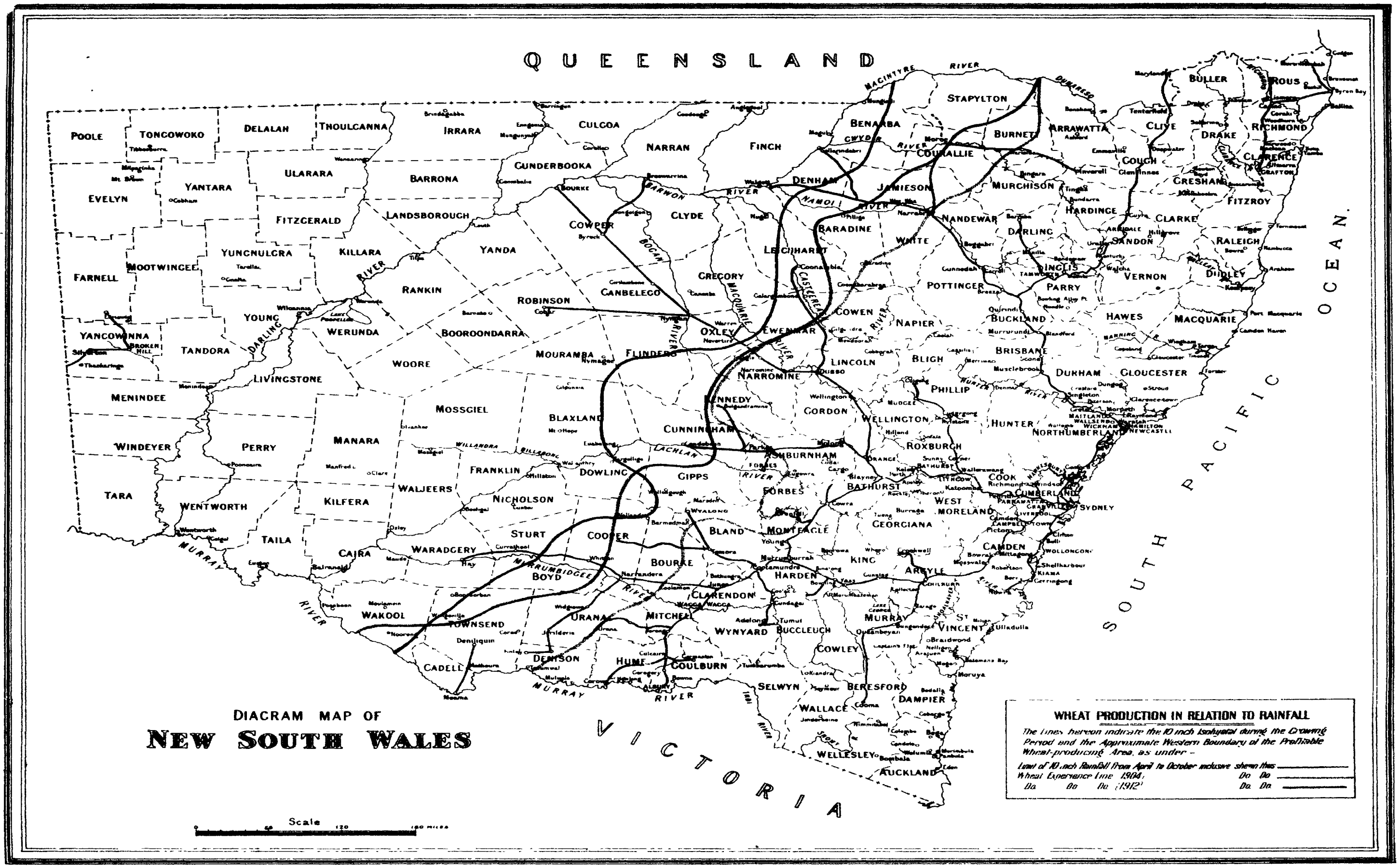

DIAGRAM MAP OF

NEW SOUTH WALES

WHEAT PRODUCTION IN RELATION TO RAINFALL

The Lines hereon indicate the 10 inch Isohyetal during the Growing Period and the Approximate Western Boundary of the Profitable Wheat-producing Area, as under—

Limit of 10 inch Rainfall from April to October inclusive shewn thus ————
Wheat Experience Line (1904) Do Do ————
Do Do Do (1912) Do Do ————

PHOTO-LITHOGRAPHED BY W. A. GULLICK, GOVERNMENT PRINTER, SYDNEY, N.S.W.

VOL. XXIII. PART 9. SEPTEMBER 2, 1912.

Agricultural Gazette of New South Wales.

Wheat-growing in Relation to Rainfall.

JOHN B. TRIVETT, Government Statistician.

DURING recent years the methods of wheat culture generally have been greatly improved. The old system of cultivation has been altered gradually to accord with modern ideas, and it is fully realised that, by the adoption of scientific methods, the area in which the cultivation of wheat may now be carried on successfully has been extended during the last quinquennium, "especially in the more arid portions of our State."

It is impossible to determine with exactitude the minimum rainfall required to ensure a profitable return from wheat-growing. Many factors must be considered, and, inasmuch as some of them are beyond our control, it will be readily conceded that the subject presents numerous difficulties. The principal factors are as follow:—

The general distribution of the rainfall.
Quantity of rain at each fall.
Evaporation.
Class of soil.
Nature of growing period.
Method of cultivation.
Varieties of wheat used.

The distribution of the rainfall is most important. Heavy falls during the early life of the plants may induce a too vigorous growth, which, to give the farmer satisfactory returns, would necessitate correspondingly heavy rains in the spring and early summer months. With heavy falls, also, there is generally a considerable loss from surface run-off. On the other hand, if the falls occur in comparatively light showers, a larger proportion of moisture is evaporated than when the rain amounts, say, to about 1 inch at a time.

As in the case of most forms of plant life, a rainfall aggregating about an inch at a time encourages deep rooting, enabling the plants to withstand more effectually any subsequent dry spell. Numerous showers of light character would, most probably, cause more surface rooting, and this is not conducive to drought-resistance.

If the growth of the wheat be rapid and continuous throughout the winter months, the growing period may be shortened considerably, and good results may be obtained even with a limited rainfall from varieties of wheats suitable to these conditions.

Much has been written both for and against the system of "Dry Farming" as practised in America, but it is not suggested that similar methods of culture should be adopted in the semi-arid portions of this State, where the conditions of soil formation and rainfall vary considerably from those obtaining in the dry-farming areas of America. The subject has received much attention, but, except for the fallowing and subsequent treatment, there does not appear to be any general practice of the system in operation. By fallowing and a proper working of the fallows it is possible to conserve considerable quantities of moisture in the soil, so that an equivalent of several inches of rain may be carried over to supplement the falls throughout the seeding and growing seasons. Another benefit accruing to the farmer who adopts modern methods of cultivation in the districts of scanty rainfall is that fallow land is always workable. For this reason there is not any necessity to await a sufficient rainfall, the absence of which has often been responsible in past years for a diminished area under crops in a number of districts where the old system of wheat growing predominates The adoption of summer fallowing, a systematic working of the paddocks to keep the growth of weeds in check, and a judicious use of artificial manures, have enabled satisfactory crops of wheat to be grown with an annual rainfall of from 4 to 6 inches less than that required to grow similar crops according to the older methods of culture. With the use of manure on fallowed land much less moisture is required during June and July to keep the wheat growing, but crops sown without manure do not make much growth during cold frosty weather.

It is not surprising, therefore, that the western boundary of profitable wheat growing, as laid down by my predecessor in office, Mr. T. A. Coghlan, has been extended further westward. It does not appear, however, that the line marking the western boundary of successful wheat cultivation, even by the employment of modern methods referred to above, will ever wholly coincide with the 10-inch isohyetal during the wheat growing period—April to October inclusive—as set out by Mr. H. A. Hunt, the Commonwealth Meteorologist, since success depends not so much on the total quantity of rain, as on the incidence of that quantity.

The Government experts have stated that the amount of grain produced by means of a given amount of moisture varies considerably for the different varieties of wheat. An excess of leaf and stem development may result in reduced yields, so that a short strawed variety, such as "Federation," should produce a maximum of grain.

On the accompanying map are shown—(1) The Wheat Experience Line as laid down by Mr. Coghlan in 1904, (2) the Western Limit of the 10 inch rainfall during the wheat-growing period, as determined by Mr. Hunt, Commonwealth Meteorologist; and (3) the Western Boundary of the area in which wheat may be grown profitably at the present time by adopting the latest scientific methods of cultivation.

Although each of the districts of Boggabilla, Boomi, Garah, Meroe, Bulyeroi, Burren Junction, Cryon, Come-by-chance, Coonamble, Gulargambone, Bobodah, Euabalong, and Condobolin receives an average rainfall of 10 inches or over during the wheat growing period, cultivation is almost entirely restricted to wheaten hay, as most of the rain occurs early in the season, and the subsequent falls during the spring months are inadequate to secure a well filled and matured grain.

Starting at the Queensland border, the area cultivated in the Yetman district is very small, but satisfactory yields of both grain and hay have been secured, so that the new line commences at the point indicated by Mr. Coghlan in 1904. The experience gained since that date, however, shows that the new and old lines soon part company. The former breaks away towards Moree, and includes Pallamallawa, Terry-hie-hie, Woolabra, Wee Waa, and Pilliga. Wheat-growing has proved very successful in the Pallamallawa district, and a steady increase in the area cultivated has been maintained. During 1911 an average yield of 13 bushels per acre was secured with a rainfull during the growing period of only 6 inches. As the spring rainfall is somewhat uncertain at Moree, very little cultivation, other than wheaten hay, has been attempted, but while the Government Experiment Farm* was in operation at Moree it was demonstrated that it is possible, with modern methods of cultivation, to obtain payable results, so that the new line must necessarily pass through the district. Around Terry-hie-hie, with proper attention, crops will give satisfactory returns, but the distance from the railway has hitherto retarded advancement. In the Wee Waa district the soil and rainfall generally are suitable for wheat-farming, especially on modern lines. So far as Pilliga is concerned, very few crops have been grown, but when the scrub areas are made available for settlement, there will be a large tract of country, mostly sandy loam, admirably suited to wheat culture As the rainfall is reported to be adequate, the district must be included within the area of profitable returns for the farmer employing the latest methods of cultivation. At Coonamble, the Department of Agriculture has established an experiment farm for the purpose of ascertaining the best methods of treating the black soil. When the problem has been solved, it will mean that the line marking the western limit of wheat production will be moved further westward to embrace the districts of Coonamble and Gulargambone. A little to the south of the last-mentioned district the new line joins that laid down by Mr. Coghlan, and the two are coincident until Fifield is reached.

The Bogan Gate-Forbes-Waroo district has given quite a number of disappointing yields. It appears that most of the land is more or less suitable for wheat-growing, and farmers who have experienced low average returns are at last beginning to realise that it is absolutely necessary to adopt scientific methods of farming to counteract the failures and low yields, due to an inopportune rainfall and faulty cultivation. For many years large tracts have been sown with wheat, and as the area has increased steadily year by year, it is highly improbable that an area aggregating 60,000 acres —half of which is in the Forbes district would be cropped for grain alone if the results were unprofitable. If it were not possible, however, to considerably augment the average yields in these districts by means of better methods of treatment, the line would have to pass to the eastward, as, although the average yield has been as high as 20 bushels per acre, the general average yield over a series of eighteen years has been as follows:—Bogan Gate and Waroo, each 8·1 bushels, and Forbes 9·3 bushels per acre.

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* Closed during May, 1910.

Leaving Waroo, the line continues to the south-west, and includes the districts of Ungarie and Yalgogrin, and for the first time crosses the western limit of the 10-inch rainfall during the growing period. The absence of railway communication has greatly retarded development in wheat production in these districts. The past season has certainly not been very favourable, but there are large areas of suitable land which will usually return payable results if the ground has been fallowed and carefully prepared and manured. Great development has taken place in each of the districts of Marsden, Bimbi, Wyalong, Barmedman, Ardlethan, Ariah Park, Grong Grong, and Narrandera, and the results obtained fully justify their inclusion within the profitable wheat-growing area.

During the season 1894–5, the Whitton district gave an average of 12·4 bushels of wheat per acre, but on only three subsequent occasions has the average yield slightly exceeded 9 bushels per acre. The average annual return for the last eighteen years is only 5¼ bushels, an unsatisfactory result, due mainly to the light rainfall during the spring months. The land has been graded as first-class by Government experts, and, with good farming, would give much better results. The Northern Murrumbidgee Irrigation Canal runs through the district, but it has yet to be demonstrated that wheat-growing on a fairly large scale will prove successful with the aid of irrigation. It is stated that the soil is very suitable for mixed farming and fruit-growing. After passing to the east of Whitton and Darlington Point, the line again cuts the 10-inch isohyetal a little to the north of Conargo, in the Deniliquin district, and continues along the Niemur River to the north of Barham, in which district the wheat crops are grown mainly in sand-hill country.

Although the season 1911–12 was very unfavourable, and crops generally did not yield up to expectations, fallowed and properly worked and manured lands in the Jerilderie, Finley, Deniliquin, Mathoura, Moama, and Barham districts gave very satisfactory returns. Cultivation has certainly decreased around Moama, but this is due mainly to the scarcity of labour, as many of the farmers have realised that it is impossible to secure payable results in dry seasons, unless the land be fallowed and properly worked. As sufficient labour is not available to ensure this treatment, wheat-growing is being abandoned in favour of grazing.

As Mr. Coghlan pointed out in his memorandum regarding the area of New South Wales suitable for wheat-growing, the average crops recorded over the greater portion of the dry districts of the State are much below what might be obtained. Notwithstanding the advancement made during recent years in methods of cultivation, it is still, unfortunately, the case that the majority of the farmers do not obtain from their land anything like the results which are possible under good treatment.

The conservation of moisture by fallowing and subsequent cultivation has not received sufficient attention, and the use of artificial manures should be much more general.

In determining the present line marking the western limit of successful wheat-growing, due consideration was given to the low yields attributable to bad farming, as well as to losses by other preventable causes, such as rabbits, &c. This is a very necessary precaution, for the average returns for the various districts do not always accurately disclose the possibilities of the districts, and the object of this report is to show approximately the area in which wheat production may be profitably undertaken, provided the farmer is prepared to adopt the latest approved methods of cultivation.

It must not be concluded, however, that the wheat line as now laid down will remain stationary. There are still large areas, especially in northern and western Riverina, admirably suited to wheat cultivation. With the advance of settlement, the cutting-up of large estates, and the extension of railway communication, there is every reason to believe that the area now known as the Wheat Belt will be extended considerably in the early future.

A comparison of the two wheat experience lines shows that since 1904 a very large tract of country has been added to the Wheat Belt. The area between the lines has been estimated at 13,430,000 acres, of which 4,091,000 acres are in the Northern portion of the State, the balance—9,339,000 acres—being mostly within the Riverina division. Of this area, 858,000 acres are outside the western limit of the 10-inch rainfall during the wheat-growing period.

In conclusion, I desire to express my indebtedness to Mr. Hunt, Commonwealth Meteorologist, to Mr. Peacock, Manager of the Bathurst Experiment Farm, and to a large number of wheat-growers who very kindly furnished me with valuable information as to the rainfall required, and the methods of cultivation adopted in the various districts.

RAILWAY RATES FOR CARRIAGE OF HONEY.

THE Chief Commissioner for Railways has approved of the charges for the conveyance of honey by rail being reduced from "B" to "A" class rate and conditions, and the necessary by-law has been forwarded for the approval of the Executive Council. This means that for the future the rates per ton will be as follows, 2 tons being the minimum :—

Miles.	Rate per Ton.	Miles.	Rate per Ton.
	s. d.		s. d.
50	6 7	300	26 5
100	11 10	400	30 7
150	16 0	500	34 9
200	20 2	600	38 11

Our Natural Pastures.

REVIEW OF CORRESPONDENCE RECEIVED.

E. BREAKWELL, B.A., B.Sc., Economic Botanist.

A LARGE amount of correspondence has been received as the result of the article headed, "Our Natural Pastures," which appeared in the July issue of the *Gazette.* Willing co-operation has been promised by all the writers, and a vast field has been opened up for practical experimental work. An effort will be made to establish trial plots, where desirable, by next autumn, with a view of determining the latent possibilities of the native grasses and fodder plants.

Summary of Correspondence.

For convenience, the areas from which the correspondents write are grouped into four, viz :—North-western Tablelands and Slopes, Central Tablelands and Central-western Slopes, Coastal, and Southern Tablelands.

The best grasses, according to the writers, are as follow :—

North-western Tablelands and Slopes.	Central Tablelands and Central-western Slopes.	Coastal.	Southern Tablelands.
Kangaroo. Mitchell. Wallaby. Blue. Umbrella.	Barley. Kangaroo. Wallaby Blue. Foxtail.	Introduced grasses, such as Rhodes, *Paspalum* and *Phalaris commutata.* Some writers, however, uphold the virtues of such native grasses as *Chloris ventricosa* (Blue star), *Eragrostis leptostachya* (Paddock love), and Kangaroo grass.	Kangaroo. Snow grasses. Prairie. Rye grasses.

Carrying Capacity.

As may be expected, the carrying capacity varies considerably in different instances. There are all gradations between the two extremes of 1½ sheep per acre to 1 sheep per 8 acres; or from 1 large beast to 3 acres to 1 beast to 12 acres.

Any *unproductiveness* is due either to drought combined with overstocking, rabbits or scalded patches. One correspondent, with some justification, writes:—"I believe that scalded patches, if seeded, would soon carry herbage."

Some striking divergences are shown between the carrying capacities in good and bad seasons. For example :—

(*a*) The largest number of stock I have had on my area (6,000 acres) has been 9,000 sheep for six months on a big crop of herbage. My general stocking is 2,500.

(*b*) I have run as many as 1,000 ewes and lambs and 16 head of big stock for seven months, and they seemed to do very well . . . . At the present time I can only carry 500 sheep and 14 stock, and I have to hand-feed them. My holding is 666 acres.

(*c*) My lease comprises 1,900 acres. Three years ago there was a good season, and I carried 700 ewes and lambs for ten months, besides 30 head of large stock ; and, in addition, I took in two lots of travelling cattle of 400 each for a fortnight, and had plenty of grass left. Rabbits since then have eaten out very much, and last season I carried only about 60 sheep and 50 head of cattle.

Some Points worth considering.

(1.) Nearly all the correspondents from the Western districts uphold the virtues of barley grass. This grass is an introduced grass (*Hordeum murinum*), and is becoming more prevalent each year. Now barley grass has, from time to time, been condemned through the pages of the *Gazette*. When mature it is found by analysis to contain an unusually large amount of indigestible fibre ; and as it dies down in summer, the plant being an annual, its obnoxious bristly heads of spikelets are apt to cause irritation and injury to stock. Although it may provide a fair amount of feed in winter and early spring, when most grasses are dormant, still it is possible and desirable in many instances to replace this obnoxious grass by a better fodder plant.

(2.) Winter grasses are badly needed in many places, particularly on the Tablelands. Thus a writer from Cooma :—

The only grasses in the neighbourhood are kangaroo and snow grass. Both are summer grasses, and although prolific in summer, the first frost blights them. There is no winter grass, although the average rainfall is high.

Prairie and *Phalaris commutata* appear to be rapidly coming into favour as winter grasses. The trouble with prairie appears to be that, as it is an annual, care is required in stocking. *Phalaris commutata*, a winter grass which is doing exceedingly well at Hawkesbury Agricultural College and Glen Innes Experiment Farm, has a particularly strong advocate in the irrigated country :—

I put in some *Phalaris commutata* about two years ago, and I may say that I know of no grass that will stand grazing better ; in fact, the more it is grazed the better it is, and all stock are fond of it. I am going to grow it extensively.

(3.) Only one writer out of fifty mentions a panic grass. But perhaps this is not remarkable. The panic grasses are undoubtedly as a class the most nutritious of our native grasses. This fact, combined with overstocking, would tend to bring about either a considerable diminution in numbers, or an early disappearance altogether. But one writer in the North-west is alive to the importance of keeping such nutritious grasses thriving, and he is worth quoting :—

The best grass on the place is undoubtedly Coolah grass (*Panicum prolutum*). When I took up this lease, the country had been scandalously treated . . . . . and completely eaten out. The only grass left on it was what is termed locally No. 10 wire grass, very poor feed. *Fortunately, by lightly stocking and nursing the good grasses, I have got rid of it.* Coolah grass came first in odd tussocks, and gradually spread, till I have got a large quantity of it on the lease ; in fact, more of it than any other. The great

virtue, to my mind, in the Coolah grass is that it will send green shoots whenever it rains, in winter and summer . . . . It is a hard matter to get the Mitchell grass to spread, as the stock keep it eaten down. *The way I have done was to shift the stock out of the paddock when I saw the seed starting to form, and keep them off till the seed was ripe enough to fall off it. My experience is if you do not do this you will not get it to spread.*

(The Italics are mine).

This grass, *Panicum prolutum*, is showing considerable promise at Bathurst Experiment Farm.

Another grazier in the Upper Hunter district testifies how, by nursing the best grasses, he has increased the carrying capacity of his land six-fold.

All this goes to show that nature must be assisted if the State wishes to maintain her reputation as the finest sheep-growing country in the world.

THE PERCOLATION OF PHOSPHATIC MANURES THROUGH THE SOIL.

MR. R. H. LOUGHRIDGE, Professor Emeritus in Agricultural Chemistry in the University of California, recently instituted a series of experiments to ascertain to what extent phosphoric acid, added in the form of phosphatic fertilisers, is carried deep into the soil by the action of the rain in different types of soil in that State. The experiments were made primarily for the purpose of finding out whether these manures, when added in the orchard, are carried down to the roots of the trees, but the results thus far (the experiments being incomplete) are of particular interest to wheat growers in New South Wales who apply superphosphate when sowing their crops.

Professor Loughridge says the results are emphatic, and show that, except in very sandy soil, the phosphoric acid does not reach the roots of trees, but is retained in the upper few inches, even in the presence of a heavy rainfall. Using a high-grade superphosphate, carrying 17 per cent. of soluble phosphoric acid, it was found that heavy clay soils would retain 1,000 lb. per acre in the upper 3 inches, that a loam soil would hold that amount in 6 inches, while a sandy soil would allow it to pass quite deep. He adds that he was struck by this "locking-up" of phosphoric acid at the surface in the examination of the soil of an orange orchard where liberal applications of phosphates had been made for many years. The examination of the soil (black clay) showed that the amount of phosphoric acid in the upper 6 inches was ·30 per cent., while in the next 6 inches, and still deeper, the percentage was only ·05. Evidently the upper 6 inches had retained all the phosphate that had been added in many years.

Paddock Accounts from Wagga Experiment Farm.

As the economic conditions prevailing at Government Experiment Farms are not similar to those which private farmers meet, returns showing the exact expenditure upon and receipts from areas devoted to crops, do not serve as a fair indication of what farmers may expect to receive by following Departmental methods. By direction of the Minister of Agriculture (Hon. J. L. Treflé, M.L.A.), the Manager of Wagga Experiment Farm has prepared the following paddock accounts for last year's crops, showing the expenditure and returns from a farmer's point of view, assuming that in each case his paddocks had received similar treatment to that carried out at the Experiment Farm :—

PADDOCK NO. 5A.

Dr. Wheat ; area, 59 acres. *Cr.*

	£	s.	d.		£	s.	d.
To Seed, 45 bushels, @ 5s. 6d....	12	7	6	By 876 bushels wheat ...	160	12	0
Manure, 29½ cwt., @ 5s. 3d.	7	14	10				
Ploughing, 4s. 3d.	12	10	9				
Harrowing and rolling, 1s. 8d.	4	18	4				
Drilling, 1s. 6d.	4	8	6				
Harvesting, 3s.	8	17	0				
Bags	6	13	10				
Cartage to rail	5	18	8				
Wear and tear, 2s. 6d. ..	7	7	6				
Rent, 6s.	17	14	0				
	£88	10	11				
Balance profit	72	1	1				
	£160	12	0		£160	12	0

PADDOCK NO. 7.

Dr. Malting Barley ; area. 35 acres. *Cr.*

	£	s.	d.		£	s.	d.
To Seed, 21 bushels, @ 4s. 6d....	4	14	6	By 938 bushels barley, @ 4s. 9d.	222	15	6
Manure, 17½ cwt., @ 5s. 3d.	4	11	10				
Ploughing, 4s. 3d.	7	9	9				
Harrowing, 1s.	1	15	0				
Rolling, 8d.	1	3	4				
Drilling, 1s. 6d.	2	12	6				
Harvesting, 4s.	7	0	0				
Bags	7	9	6				
Carting to rail	5	5	0				
Wear and tear, 2s. 6d. ...	4	7	6				
Rent, 6s.	10	10	0				
	£56	18	11				
Balance profit	165	16	7				
	£222	15	6		£222	15	6

Paddock No. 6.

Federation Wheat; area, 68 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Seed, 42 bushels, @ 5s. 6d.	11	11	0	By 1,637 bushels wheat, @ 3s. 8d.	300	2	4
Manure, 34 cwt., @ 5s. 3d.	8	18	6				
Ploughing, 4s. 3d.	14	9	0				
,, (2nd), 3s.	10	4	0				
Harrowing and discing fallows, 5s.	17	0	0				
Drilling, 1s. 6d.	5	2	0				
Harvesting, 4s.	13	12	0				
Bags	12	9	9				
Cartage to rail	11	11	0				
Wear and depreciation, 2s. 6d.	8	10	0				
Rent, 6s.	20	8	0				
	£133	15	3				
Balance profit	166	7	1				
	£300	2	4		£300	2	4

Under our methods of harvesting and selling grain, the sale of seed and other grain would realise £406 6s. The sale of straw, saved by the reaper and binder, at rates prevailing would return £170 nett. The added cost of harvesting by reaper and binder, threshing and grading grain, would be £60 16s. 3d., making a difference in profit of £215 7s. 5d.

Paddock No. 3a.

Zealand Wheat; area, 90 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Seed, 69 bushels, @ 5s 6d.	18	19	6	By 1,469 bushels milling wheat	269	6	4
Manure, 34½ cwt., 5s. 3d.	9	1	1				
Ploughing, 4s. 3d.	19	2	6				
,, (2nd), 3s.	13	10	0				
Harrowing and discing, 5s.	22	10	0				
Rolling, 8d.	1	16	0				
Harvesting, 3s.	13	10	0				
Bags	11	4	7				
Cartage	10	8	3				
Wear and tear	11	5	0				
Rent	27	0	0				
	£158	6	11				
Balance profit	110	19	5				
	£269	6	4		£269	6	4

Under our methods, the sale of wheat for seed, &c., realised £378, and straw at prevailing price was worth an additional £280 nett. The added cost of production in harvesting by reaper and binder, threshing and grading, would be £67 1s. 6d., the difference in profit being £321 13s. 2d.

PADDOCK No. 4A.

Wheat and Barley; area, 90½ acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Seed	19	1	6	By 1,279 bushels milling wheat	234	9	8
Manure	11	17	7	141 bushels skinless barley	35	5	0
Ploughing	24	17	9				
Harrowing, 1s.	4	10	6				
Rolling, 8d.	3	0	4				
Drilling, 1s. 6d.	6	15	9				
Harvesting, 3s.	13	11	6				
Bags	10	17	3				
Cartage to rail ..	10	4	9				
Wear and tear, 2s. 6d. ..	11	6	3				
Rent, 6s.	27	3	0				
	£143	6	2				
Balance profit .	126	8	6				
	£269	14	8		£269	14	8

Students' Quarters, Wollongbar Experiment Farm.

Diseases of Animals.

Compiled by the Veterinary Officers of the Stock Branch under the authority of
S. T. D. SYMONS, M.R.C.V.S., Chief Veterinary Officer.

No. 4.

FLUKE.

"FLUKE" is the name given to a parasite infesting the livers of sheep, cattle and other domesticated animals, and in some instances causing heavy mortality. The parasite most commonly met with under this name in New South Wales is the *Distoma hepaticum*, although other species of *Distomata* may be found responsible for similar disease and mortality.

Description.

The "fluke," as it is found in the liver of affected animals, is a flat, leaf-like worm, pale brown or greyish brown in colour, oval or lanceolate in shape, broader and rounder in front, with two suckers, one in front small and round, and the second on the under surface, a little behind the first. It ranges from ½ to 1 inch long, and ⅓ to ½ an inch broad.

Life-history.

The adult fluke does not reproduce young resembling itself and capable of infecting stock directly, but produces eggs which develop into organisms totally different from itself, and leading a parasitic life in other animals. The adult fluke takes about three weeks to mature after gaining the liver, and three weeks further before egg-laying commences. Each adult produces many thousands of eggs, which may be expelled in the bile or intestines, and pass out in the fæces. If the eggs fall on to dry ground they become dessicated and die. If they are deposited in moisture they hatch into embryos. Warmth favours this hatching; extreme cold prevents it. This embryo is free swimming, and seeks various kinds of snails, into which it penetrates, and in the body of which it becomes fixed and undergoes a second process of multiplication, developing into forms known as "*rediæ*." These, again, undergo a process of division, and from each "*redia*" are produced several "*cercariæ*."

It will thus be seen that each egg may develop into a large number of "*cercariæ*," each of which bores its way out of the snail, and after swimming about in the water for some time, it attaches itself to a blade of grass or some aquatic plant. Here it forms a cyst round itself, and remains quiet until swallowed by some animal. It is, therefore, in consuming the herbage of damp pastures that animals become infested. When the attached *cercariæ* reach the intestine, they find their way to the liver, and there develop into fluke, and so complete the life cycle.

Occurrence.

The disease is essentially one of wet seasons, appearing then as an epizootic, is most severely experienced in low, marshy country, and, while not noticed much in summer, causes most severe ravages at the end of winter and the beginning of spring.

Symptoms in Sheep.

If the animal is in good condition and the food supply abundant, it will resist the attacks of even large numbers of fluke without showing marked symptoms of disease; but, on the other hand, if the animal is in poor condition, a few fluke may create grave disturbance.

When the sheep are first attacked by fluke, although no general signs of disease are manifested, deaths not infrequently occur. Otherwise the sheep are even inclined to do better, and put on condition faster than before infestation.

As the disease progresses the sheep become less lively, and the visible mucous membranes of the eyes and mouth become pale and anæmic. Later the appetite fails, and rumination is interfered with. The skin and membranes of the eye become pale and yellowish; the wool is dry, ragged, and parts easily from the skin. In many cases considerable swelling occurs below the jaws ("bottle") and diarrhœa sets in. Emaciation becomes very marked and the animals die from exhaustion.

Symptoms in Cattle.

Infestation in cattle is rarely so severe as to cause marked symptoms, but when they do occur they follow the same lines as in the case of sheep.

Post-mortem Appearances.

The first effect of fluke is to cause some inflammation of the liver, which organ, if the number of fluke is very large, becomes enlarged and engorged with blood. The contents of the liver become softened, and are easily broken down—hence the term "Liver Rot." If a sheep is killed in the final stages of the disease, a considerable accumulation of fluid may be found in the abdomen and in the subcutaneous tissues between the jaws; the animal will be obviously anaemic, the liver enlarged, irregular in shape, and showing the course of the bile ducts as thick white lines. If these are cut into, it will be found that the walls of the duct are thickened, and that the ducts contain "fluke" in large numbers, and a fair amount of brownish gritty matter. In rare cases, "fluke" may be found in the lungs and other organs.

Diagnosis.

Diagnosis in early cases is not easy, but in the latter stages a *post-mortem* will easily reveal the cause of disease.

Treatment.

There is no reliable curative treatment, owing to the location of the adult fluke; but the symptoms may be greatly alleviated by a supply of good nutritious feed.

Preventive Measures.

Preventive measures must aim at destroying the eggs and embryos of the fluke, the snails which act as an intermediary host, and the *cercariæ* which infest the sheep. Much good may be done by the following :—

(1.) Destroy carcases of sheep dead of fluke, and infested livers of slaughtered sheep. This will destroy large numbers of adult fluke.

(2.) Remove infested sheep to dry pastures ; the ova excreted from the sheep will thus be deposited on dry country, and will not develop.

(3.) Drain wet and boggy pastures, or fence off. Draining will lower the numbers of snails, and will safeguard the sheep from feeding over the class of country most likely to be infested.

(4.) Burn off pastures. This will destroy large numbers of *cercariæ*, snails and ova.

(5.) Water stock from troughs in preference to ponds and dams.

(6.) When possible, dressing the pastures with lime and salt is a very effective measure.

If sheep must be placed on infected pastures, the ill effects resulting from fluke may be greatly reduced by the following precautions :—

(1.) Avoid overstocking. If sheep are compelled to feed on short grass, there is more likelihood of their picking up vigorous *cercariæ*.

(2.) Allow all sheep plenty of lick of salt and sulphate of iron, in the proportion of 40 of salt to 1 of sulphate of iron.

DALGETY'S ANNUAL WOOL REVIEW.

FROM the *Annual Wool Review* for the past season, published by Messrs. Dalgety & Co., Limited, it appears that the sheep flocks of Australia and New Zealand now number 117,011,654, an increase of 977,481 head since last year. This is the highest total for the past eighteen years, but in 1891 the number was 124,991,920 head. The wool clip, however, surpassed all records, the actual oversea shipments amounting to 2,513,915 bales (832,761,846 lb.), valued at £29,591,874. The total value of the 1,926,926 bales sold in Australasia for the year was £22,682,090. The *value* of the exported wool was not as great as last year (31½ millions sterling), as the average value per bale was £12 10s. 4d. in 1910-11, and £11 15s. 5d. in 1911-12.

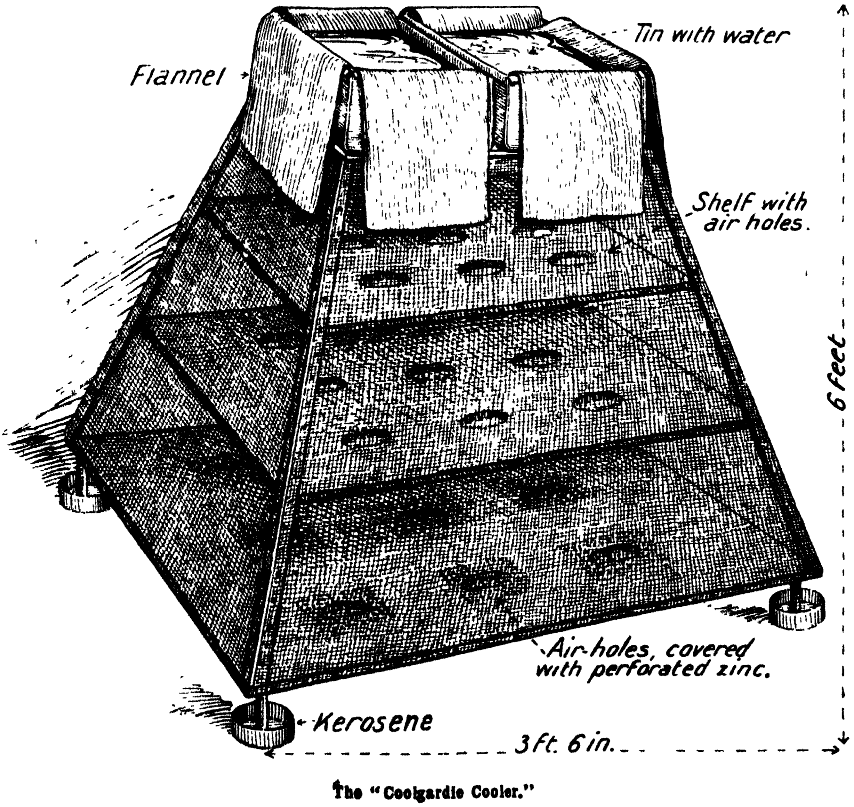
There are many other instructive tables and comparisons, as well as opinions upon future prospects, in the *Review*, which will be read with interest by pastoralists and wheat-and-sheep men.

The "Coolgardie Cooler."

Mr. E. C. Saint-Smith, Field Geologist of the Western Australian Government, formerly an officer of the New South Wales Department of Mines and Agriculture, writes as follows from Southern Cross, Western Australia:—

"These fields are fearful places for ants in the summer; said pests are crawling all over me as I am writing, and there is no place immune from their raids. There is a very successful method of cooling in use in Western Australia, which might well be adopted in New South Wales for the summer months. In fact I am not sure that a few of them are not already used in the interior of the old State.

"It consists of an oblong or pyramid-shaped framework of wood, with canvas or hessian sides. On the top is stood a dish with water, in which are placed flannels, baize or other absorbent material. One end of the flannel



The "Coolgardie Cooler."

hangs out over the dish to below the water-level, so that a syphon action takes place and the water soaks out on to the canvas side of the 'cooler'; the evaporation from the latter causes the cooling. They are known as 'Coolgardie Coolers.'

"It is advisable to have air-holes, covered with perforated zinc, at the bottom; air-holes in the shelves; and air-holes at the top, to allow of a circulation of the air, so that things in the cooler will not get musty by being in the same air too long. Also have the cooler a few inches off the ground, and stand the legs in kerosene to keep the ants away.

"Wash the flannel and the canvas sides about once a week, so as to keep the pores of the material open and allow the water to circulate quickly.

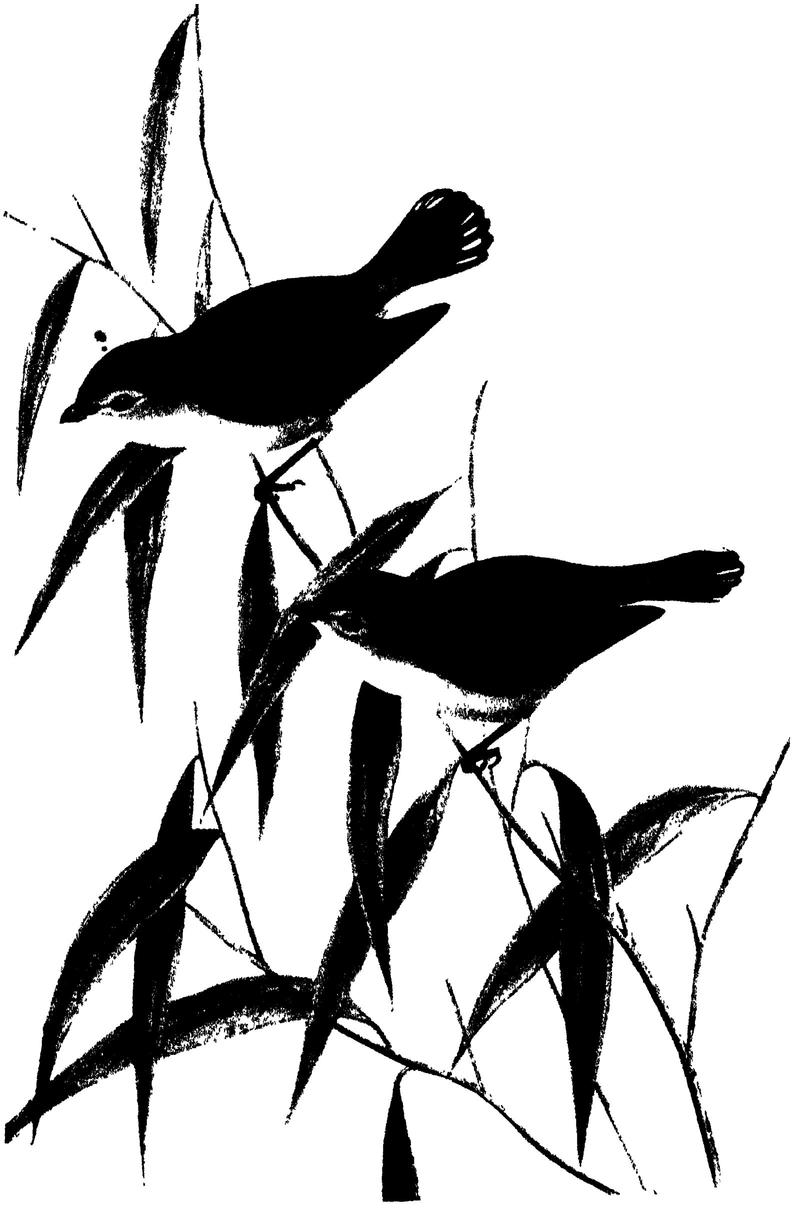
"Make the door fly-proof when shut by means of the usual slit of wood on the inside.

"A kerosene tin cut in halves lengthwise, so as to make two trays side by side, is a good cheap idea, and allows space between the trays for an air-hole. A few feet (say 3) of the smallest diameter rubber tubing assists the syphoning action if the flannel is not drawing the water fast enough.

"Where ice is unobtainable, these coolers are a great success, especially where water for the dish on top is abundant. Water is none too plentiful here, so we have to go easy. Two gallons a day are ample for a large cooler."

IMPORTATION OF BANANA-PLANTS.

A CORRESPONDENT inquires whether there are any restrictions on the importation of banana-plants to this State from Fiji. Under the Federal Quarantine Regulations, banana-plants are prohibited from being introduced into the Commonwealth unless the authorities are satisfied that the beetle-borer of the genus *Spheniphorus* does not exist in the country from which it is intended to obtain such plants. As it is known that this particular beetle-borer does exist in Fiji and other banana-growing countries abroad, it is feared that there is no probability of permission being granted to introduce banana-plants from oversea.—H. V. JACKSON, Chief Quarantine Officer for Plants.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"SHORT-BILLED TREE TIT."

Smicrornis brevirostris, Gould.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"BLUE JAY."

Coracina robusta, Latham.

Insectivorous Birds of New South Wales.

[Continued from page 664.]

31. Short-billed Tree-tit.

THE scientific name of this bird, translated literally, means "A small bird with a short beak." The "Tits," or "Tom-tits," belong to two genera, *Smicrornis* and *Acanthiza,* and this particular species is illustrated to draw attention to the fact that the Tits are purely insectivorous birds, and worthy of careful protection for the good they do in destroying the smaller forms of insect life. But as a general rule, a boy does not regard a Tit as worth the expenditure of one of the small quartz stones with which he fills his pocket when he goes out with his catapult, whilst to discharge a pea-rifle at nothing higher in the bird world than one of these would bring upon him a burst of ridicule from his companions.

For the Tits are the "common hedgerow birds of our continent," found generally in light sapling forests, flying from tree to tree in a manner which usually attracts little attention and no comment. The following extracts from ornithological works respecting this species may serve to show the whole family in what is popularly a new light:—

"It clings to the branches in all sorts of positions, now on the upper surface and then below, while it makes a thorough overhaul in search of insects, scales, and hardwings."—HALL.

"In its actions it closely resembles the typical *Acanthizæ*, clinging to the leafy sprays and diligently searching for minute insects and their larvæ."—NORTH.

"The birds singly or in small families thread the leaves of the forest rafters high and low in search of minute insects and their larvæ, upon which they feed."—CAMPBELL.

This Tit is found throughout Eastern Australia. The nest is small and roundish, with a narrow spout-like entrance, and is generally built of fine grasses and spiders' webs woven together. It is placed near the top of a gum sapling or tea-tree, and two or three eggs of a dull purplish brown colour are laid. Probably two or more broods are reared each season. The young birds soon acquire the same plumage as the adults, and there is very little difference in appearance between male and female.

32. Blue Jay.

In orchard districts this black-faced bird is not finding much favour with the settlers, as it is fond of various fruits and grapes; but elsewhere it is performing a very useful service. Mr. North states that, whilst it is very destructive in orchards and vineyards, stomachs that he has examined contained principally caterpillars, also the smaller species of Phasmidæ and other soft-bodied insects, grasshoppers, and a few small seeds and berries. Mr. Hall also states that "the food of the bird is very varied—insects, their larvæ, ants, &c. From the stomach of one I extracted more than 100 ants, similar to the 'sugar' kind, popularly known as the stingless section; among them were two large specimens of the Coccinellidæ."

The opinion of ornithologists is thus in favour of the bird; hence its inclusion in this series.

The Blue Jay is migratory, extending over the whole continent and the islands to the north, but it may be found in New South Wales throughout the year. The plumage alters from youth to maturity, so much as to cause Gould to express doubt as to the correctness of his classification of species.

The nest is remarkably small for the size of the bird, and is cunningly constructed so as to resemble portion of the tree upon which it is placed; consequently it is rarely found, except when the bird is observed building or sitting. Two or three handsome eggs are laid, the ground colour being dark olive green, blotched or spotted with dark brown. The breeding season continues from August to the end of January.

CROP ROTATION AND FERTILISERS.

"THERE are many who think that crop rotation is a substitute for manuring. Crop rotation alone, without adequate manuring, will not increase, nor even maintain, the soil's fertility. No system of crop rotation can add one single pound of any of those *inorganic* elements so essential for plant growth. . . A rational system of crop rotation *does* increase the *organic* content of the soil, simply because the plant can obtain its organic matter from the carbon dioxide of the atmosphere. . . . . Rotation of crops must be supplemented by the application of inorganic manures, if the fertility of the soil is to be maintained or increased."—A. E. V. RICHARDSON, in Victorian *Journal of Agriculture.*

ROOTING GRAPE CUTTINGS.

A CORRESPONDENT asks for advice how to root grape cuttings. To encourage the formation of roots, it is advisable to scratch the bark of the bottom end of the cutting. This can be done by rubbing the end of the cutting on a curry-comb, thus removing strips of the bark so as to reach the wood. Then the cuttings are planted in the nursery-bed. A sandy soil, or a very fine sandy loam, is preferable to any other ground. The soil placed at the bottom of the cutting must be well pressed down with the foot, so that the bottom of the cutting is firm in the soil.—M. BLUNNO.

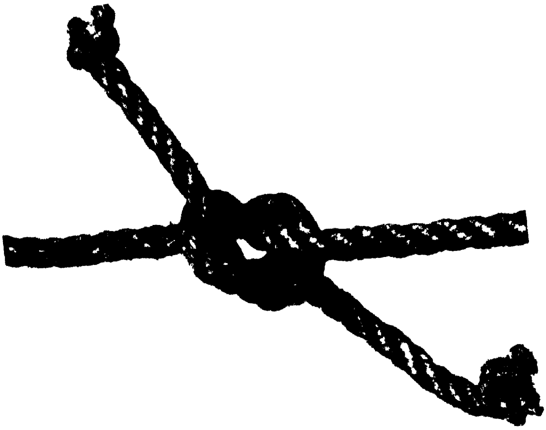


Fig. 13.- The Granny. The worst knot to use when joining ropes.

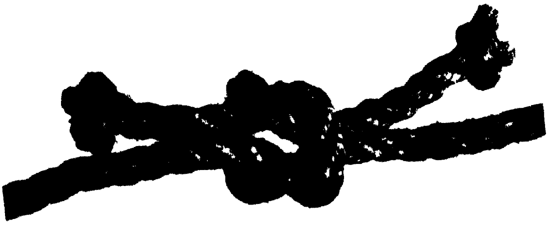


Fig 14. -The Reef Knot.

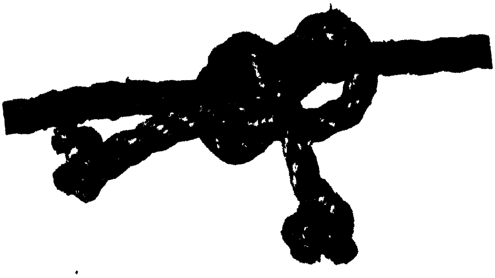


Fig. 15 (a).—The Sheet Bend.

ROPE ON THE FARM.

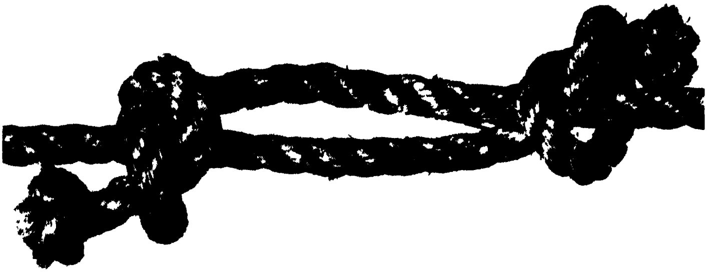


Fig. 16. The Fisherman's Knot.

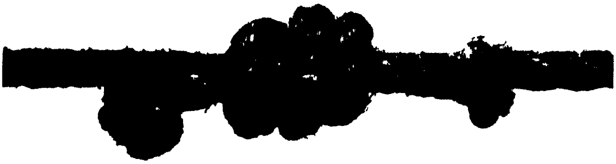


Fig. 17.—The Fisherman's Knot hauled taut.

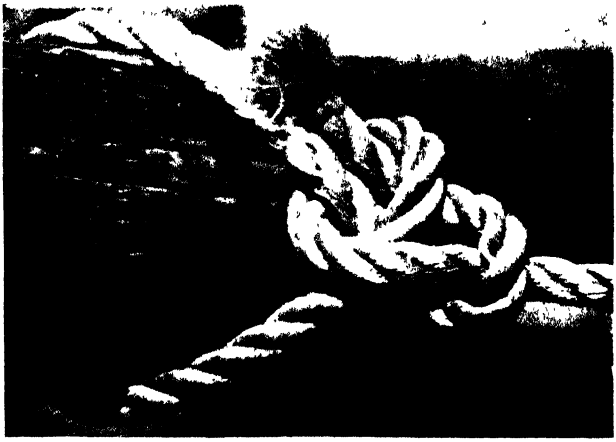


Fig 19. The Bowline.

Rope on the Farm.

Rope.

ITS USE AND CARE ON THE FARM.

[Continued from page 604.]

J. W. HADFIELD,
Instructor in Agriculture, Hawkesbury Agricultural College.

THERE is such an array of knots that it is a difficult task to select just those that the farmer will find most useful. A few stand out prominently by virtue of their utility, but for the rest an endeavour will be made to describe types, and there should be little difficulty experienced in modifying or elaborating them according to requirements.

First and foremost are the methods of joining of two ropes together. The commonest and most inefficient knot to use is undoubtedly the "Granny" (Fig. 13). If not tied tightly it will slip; and when once it catches it jams so tightly, and is so difficult to undo, that it is often a cause of grave danger. The "Reef" knot (Fig. 14), which should always be made in its place, is very similar, and may be confused with it. The first tie is the same in both cases, the difference in the knots being that, in the "Reef" knot, the end that comes over from on top, remains on top when crossed for the second tie, while in the "Granny" it is crossed below for the second tie.

It may be worth noting here that a "Reef" knot is easily undone, by taking either end and giving it a sharp pull over in the opposite direction to which it is pointing. This will straighten it out if the material is pliable, and the end can then be easily drawn out. This is a good method to adopt with

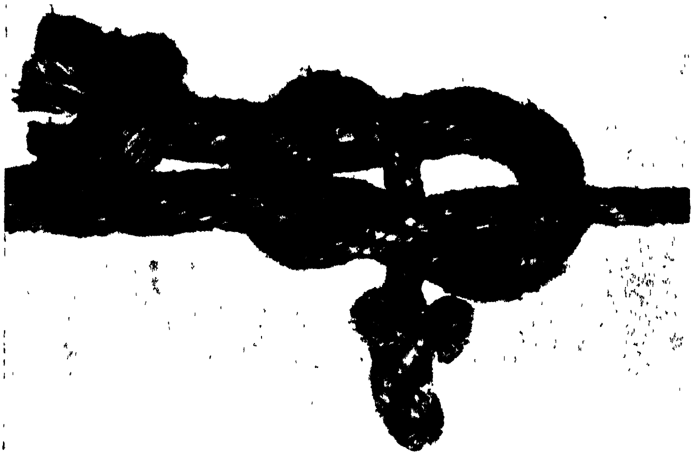


Fig. 15 (b).—Joining two ropes of uneven size with the Sheet Bend.

bandages or string, and when there is no knob on the end, but if there is a knob, or the material is fairly stiff, the easiest plan is to push one end back.

The "Reef" is easy to undo, and under ordinary conditions should never slip; but where a thin rope is to be tied to a thick one, the "Reef" will slip, and it is best then to use the "Sheet Bend" (Fig. 15). The latter can be used when a small rope is heaved, say, over a limb of a tree, and a thicker rope pulled up after it. The "Sheet Bend" is not permanent, and will soon come undone if the rope gets slack or the strain is intermittent.

The safest way of tying two ropes together, whether of the same thickness or not, is by what is termed the "Fisherman's" knot (Fig. 16). It will take some practice to make this successfully, and the overhand knots should be made in such a way that they fit over one another when drawn tight, as shown in Fig. 17. So sure is this knot, that the Alpine Club have recommended its exclusive use where ropes are to be tied together in mountain climbing.

The "Figure of Eight" knot (Fig. 18) is hardly suitable for working in rope, but it is so readily made with wire, and holds so strongly, that it is very widely used for tying fencing wire. Its disadvantage lies in the two ends, which stand out at right-angles and prevent its passing through auger holes when straining up the wires Probably two or three trials will be necessary before this knot can be tied correctly. The illustration should be examined and carefully followed.

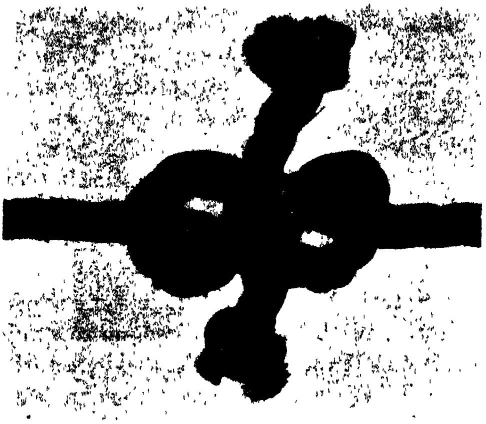


Fig. 18.—The Figure of Eight Knot.

Both on sea and land, the "Bowline" (Fig. 19) is probably more in requisition by those who know it than any other knot. The heavier the strain the tighter the knot holds, while its most marked characteristic is the ease with which it is undone. This knot should invariably be made when horses are tied up. If they pull back, it will not jam, a fault to which many knots are liable, frequently necessitating the rope being cut. Plough reins should be attached by the "Bowline," since once learnt, it is easily and rapidly made, and as easily undone. To make it, first place the rope around the post, holding the short end in the left hand. Make a loop with the right, taking care that the long portion of the rope forms the bottom portion of the loop. The short end in the left hand is then passed up through this loop, over and around the main rope, and back again downwards through the loop (Fig. 20), so that the two ropes passing through will lie parallel. The rope in the right hand is then pulled tight to finish the knot.

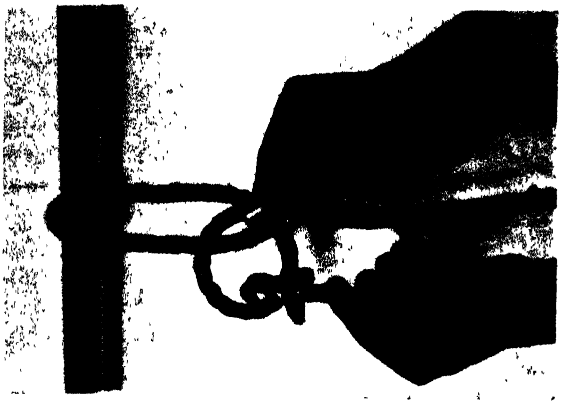


Fig. 20.—Making the Bowline.

A variation of the "Bowline," the "Bowline on a Bight," is best made by first tying an overhand knot in the doubled rope (Fig. 21). The loop is then placed above and held there with the left hand, while the right draws it down into position as shown in Fig. 22.

It makes an excellent cradle to sit in when drawing oneself up any height. As such it is called the "Bosun's Chair" (Fig. 23), and is useful in painting and other work when a ladder is not procurable or is inconvenient. The same knot is advocated by many for making the collar when throwing horses (Fig. 24) It makes a flat knot against the horse's chest, is doubled around the neck, and can readily be undone when a change in size is desired.

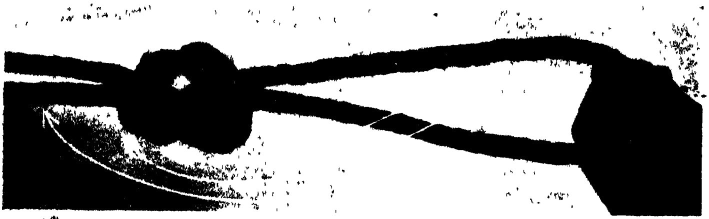


Fig. 21.—Overhand Knot ready to be made into a Bowline on a Bight.

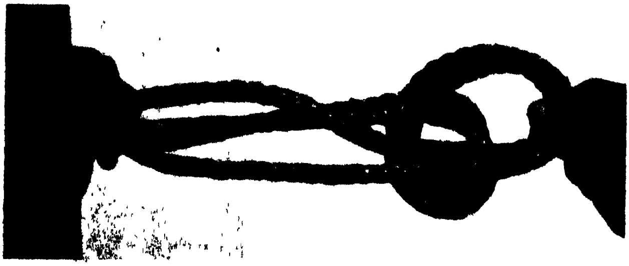


Fig. 22.—Showing the position of the loop in making the Bowline on a Bight, while it is being held down with the left hand.

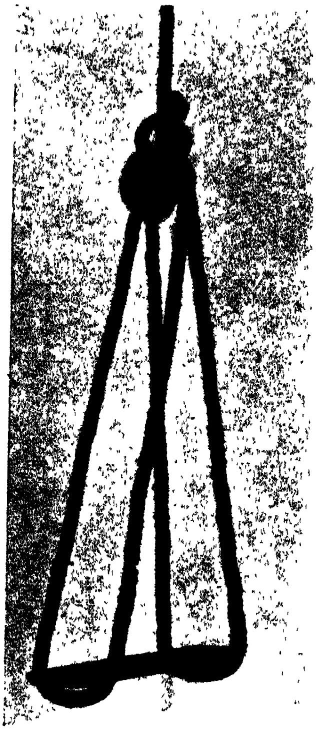


Fig. 23.—The Bosun's Chair.

The "Timber Hitch" and the "Clove Hitch" are both well known (Figs. 25 and 26). The former is the safer, while the latter is quicker and easier to make. A slight alteration made in the "Clove Hitch," as shown in the lower part of Fig. 27, makes it surer and not so ready to slip.

One of the safest of hitches is that shown in Fig. 28. The construction of such a hitch, or any other like it, prevents it from slipping sideways, making it extremely useful in tying horses to picket ropes, and in lifting and lowering round timber. One rope can also be attached to another by this means—as, for example, the guide rope of tackle used in lifting material for stacking.

To draw the lashing ropes of a load down tight, use is often made of the mechanical advantage derived from such a knot as that illustrated in Fig. 29. Make a loop in the rope as high as can conveniently be reached. Double up a portion of the loose end in the right hand and pass a few inches of it through the loop (Fig. 30). To draw the knot tight, pull evenly on the lower loop and the loose end. This loose end is then passed round the guard irons of the dray and up through the lower of the two loops. Where the "Hay" knot, as it is often called, is to be made more or less permanent, as in the case of railway trucks, &c., the top loop should take a half-hitch around the taut rope (Fig. 31). If this precaution is not observed, anyone stepping on the upper loop will cause it to slip. The knot will, of course, only hold while the rope is taut.

It is often necessary to temporarily shorten a rope, and for this purpose nothing is more satisfactory than the "Sheep-shank" (Fig. 32). If the strain slackens off, or becomes intermittent, there is danger of the knot slipping, especially if the rope is thin. The top of the "Sheep-shank" is the same as the "Hay" knot, and is therefore liable to the same danger of becoming undone.

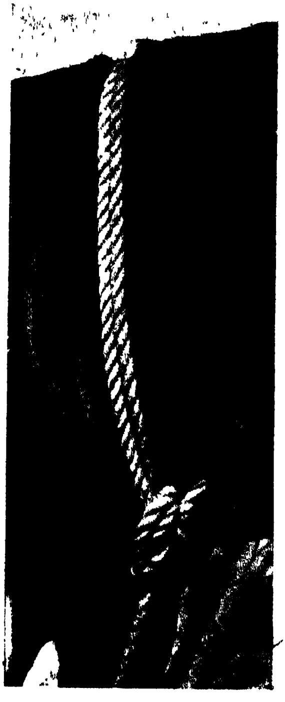


Fig. 24.—The Bowline on a Bight used for throwing a horse.

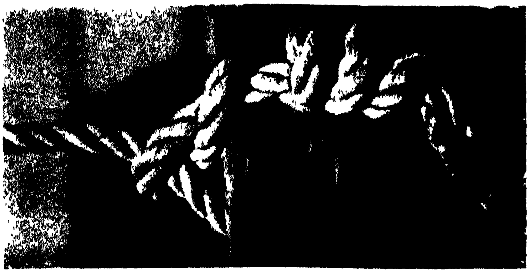


Fig. 25. - The Timber Hitch.

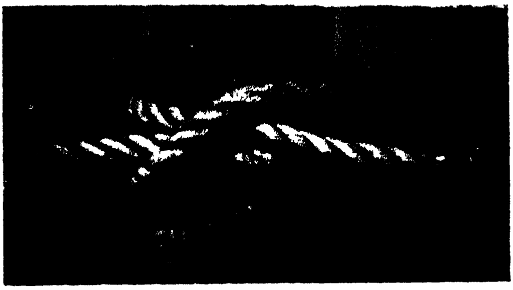


Fig. 26. -The Clove Hitch.

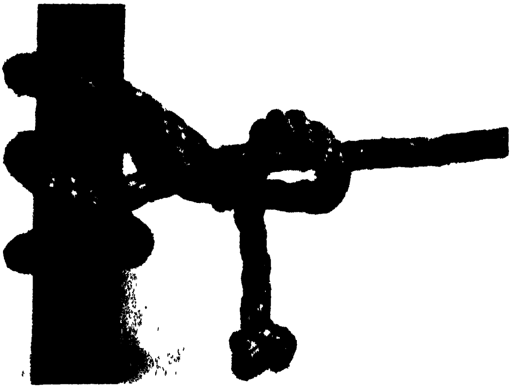


Fig. 28. The Rolling Hitch. The safest hitch, which will not slip in either direction.

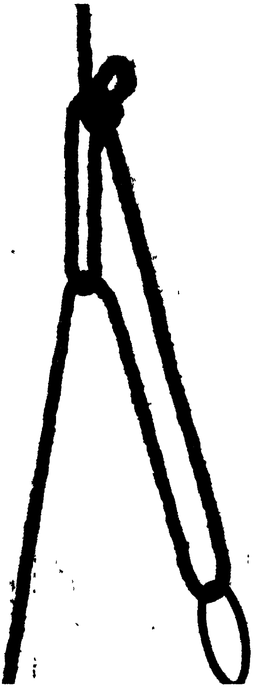


Fig. 29. The Hay Knot.

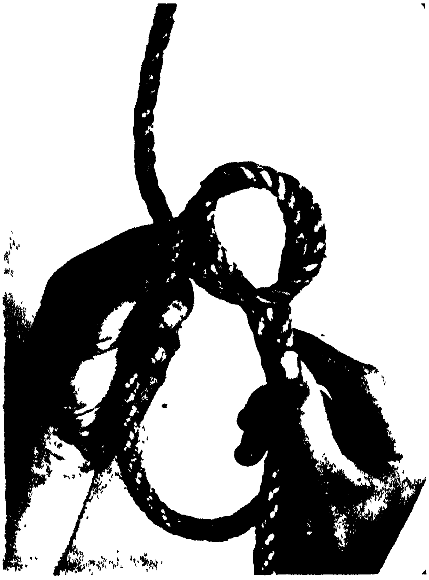


Fig. 30. - Making the Hay Knot.

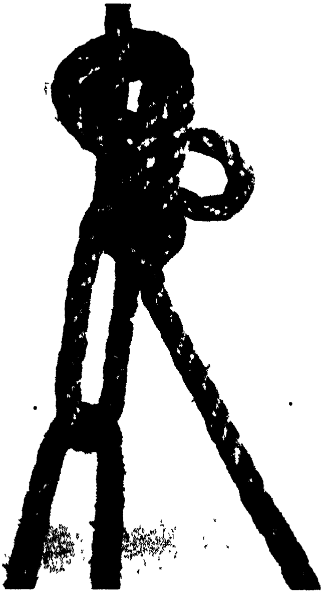


Fig. 31.—The Hay Knot made so as to prevent any chance of slipping.

**Fig. 32.—
The Sheep-shank.**

Fig. 27.—A Hitch adapted for lifting timber.

There are several ways of making it more permanent, one of the handiest being the same as is adopted in the "Hay" knot, but in this case taking a half-hitch with the loops both top and bottom.

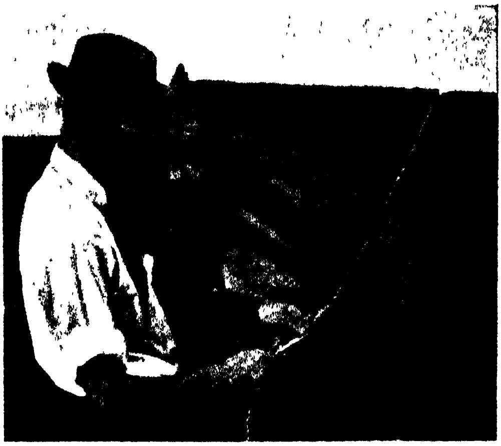


Fig. 33.—Making the Military Tie.

The "Military Tie" (Figs. 33 and 34) is a handy and neat way of doing up a leading rope. The rope is placed around the horse's neck, with the loose end on the near side where the operator is standing. This loose end is doubled up, and the three ropes held in the left hand. The right hand then winds the loose end around the three held in the left hand, working downwards, till, when it is all used up, the end is passed through the small loop remaining, which is drawn tight to hold it in position. To facilitate undoing the knot, the end is best lashed, as its great disadvantage is the difficulty of drawing out the end, especially after it has become wet.

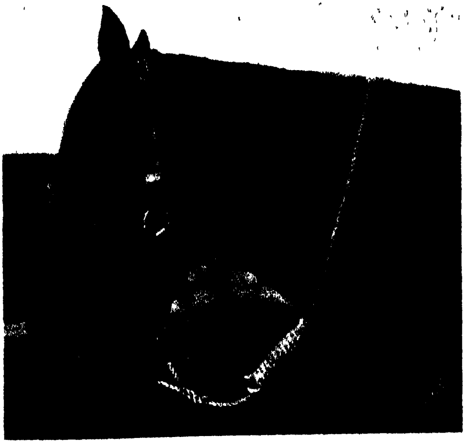


Fig. 34.—The Military Tie finished.

Butter Paper.

EUROPEAN TESTS FOR MOULDS.

C. PEDERSEN, Dairy Branch.

SOME experiments in connection with parchment paper used in the butter trade have been carried out by Drs. A. Wolff and A. Burr in Kiel, and the findings of these gentlemen should be of interest to the trade, and particularly to the manufacturers of butter. Complaints have been made from time to time that the paper used was the cause of mould appearing on the butter, and these experiments were conducted solely to determine to what extent the paper was to blame.

Owing to some of the materials used in the earlier days of the manufacture having increased in price, "glycerine," for instance, cheaper materials have been substituted, such as syrup, hygroscopic salts, or potassium chloride and magnesium chloride; and different methods of manufacture have given cause for complaints.

The papers taken for the tests were cut into 30 cm. squares, and freed from infection. These cut squares of paper were placed in three sterile glass plates, two in each, one paper over the other. Before being placed in the plates they were moistened with sterile water, sterile whey, and sterile buttermilk serum, and numbered from 1 to 3 respectively.

The object of using whey and buttermilk serum was to see if the mould spores on the paper would receive a similar medium from these, as from the liquid pressed out of a well prepared butter. By the use of sterile water the result would show whether the paper in itself contained a material suitable for the development of mould growth.

The papers were also subjected to chemical examination, to determine the amount of sugar and material soluble in water, ash, the water contents in the paper, and the weight of the paper per 100 cm.

In these experiments several interesting features came to light. For instance, it was shown that on paper poor in or free from sugar, there was none or a very weak growth of mould vegetation, no matter whether the papers were moistened with water, whey or buttermilk serum. On the other hand, on paper rich in sugar, a strong growth of mould occurred when the papers were moistened with whey or buttermilk serum, and the more sugar the papers contained the stronger the mould growth. It was also noticed that when the papers were rich in sugar, and moistened with sterile water, mould growth was rarely found.

It will thus be seen that the papers alone do not possess sufficient medium for the development of mould, and it is only when brine from the buttter reaches the paper that the growth can take place.

It was also shown, in some practical tests with butter packed in paper rich in sugar, that the more moisture given off by the butter the stronger the growth; and even a well made butter with a normal amount of brine, had sufficient medium to produce mould.

Paper rich in glycerine did not develop the same amount of mould growth as when it contained sugar, and unless the butter contained a high percentage of brine, the mould growth would be weak.

Parchment paper contains sugar, and generally speaking the percentage in water soluble matter has a bearing upon the quality that should not be lost sight of. Paper is mostly purchased and paid for according to weight, and there is no reason why these cheap substitutes should be paid for at high prices, when it is taken into consideration that they are to a great extent soluble in water and brine, and will thus be lost. In these experiments it was shown that one sample of the papers contained 31·10 per cent. of matter soluble in water, and of this 90 per cent. was sugar. Although such a paper may be sold at what seems a cheap rate, in reality it is costly. Although a cheap paper cannot be expected to be free from sugar, in no case should a paper contain more than 8 per cent. of sugar, and 10 per cent. of other matter soluble in water.

Amongst the samples tested, three showed 0·65, 0·70, and 0·80 per cent. of matter soluble in water, and were all free from sugar.

All papers contain more or less ash. Ash is, of course, harmless to butter, provided it does not contain poisonous matters, such as lead or iron. Iron does affect the flavour of butter, and a large percentage of these makes the paper heavy. Of twenty-six samples tested, the ash contents varied from 0·34 to 17·10 per cent., the average being 4·59 per cent.

After these experiments had been conducted, Mr. E. Haylund tested five different parchment papers used in Sweden. The bacteriological tests with these papers showed the same or similar results to those carried out by Drs. Wolff and Burr, under similar conditions. Mr. Haylund, however, gave some of the chemical ingredients of the papers, as shown below. In looking over this list, Nos. 1 and 2 at once attract attention. The surface measurements per kg. are 17·71 and 27·70 □ m. respectively. No. 5 is, of course, of very poor quality. Although it contains less than 8 per cent. of sugar, it contains 13·43 of soluble matter, and a high percentage of ash.

MR. HAYLUND'S ANALYSES OF FIVE PARCHMENT PAPERS.

No.	Weight per 100 □ cm. in qr.	One Kg. Paper contains □ m	Per cent.				
			Dry Matter.	Water.	Matter Soluble in Water.	Sugar.	Ash.
1	0·5645	17·71	93·36	6·64	0·52	a trace.	0·35
2	0·3610	27·70	93·08	6·92	0·37	0·00	0·24
3	0·4290	23·31	92·74	7·26	0·63	0·00	0·30
4	0·4218	22·76	93·99	6·01	0·53	0·00	0·29
5	0·4883	20·48	93·36	6·64	13·43	7·28	1·23

Indian Cane.

GEORGE MARKS, Inspector of Agriculture, North Coast.

ALTHOUGH the introduction of Indian Cane to the coastal districts only dates back a few years, its value as a fodder plant is gradually growing in popularity, and, to-day, large and small areas may be seen under cultivation extending in this State from the Queensland border to farming districts some miles south of the Hunter. Its hardiness and adaptability to various classes of soil are qualities that are not always found in fodder plants, while its capacity to produce enormous quantities of fodder rich in saccharine material, combined with its ease of cultivation, are characteristics that specially commend it to stock-owners generally.

As is the case with all plants of economic value, Indian Cane has its limitations, and it is feared that many farmers, not thoroughly conversant with it, are attempting to grow this plant in latitudes not favourable, or in situations not conducive to the best results. An erroneous opinion exists in some districts that Indian Cane is a variety of the Sorghum family, of which Planter's Friend, Early Amber Cane. and others are typical examples. A careful study of the nature and habits of growth, however, reveals marked differences. Indian Cane is a variety of sugar-cane (*Saccharum officinarum*), though not grown here for sugar production.

Sugar-canes on the North Coast.

Prior to the introduction of this variety, sugar-cane had been in cultivation for many years on certain areas adjacent to the Tweed, Richmond and Clarence Rivers. The soil and climate were found suitable for the production of heavy crops, yielding a fairly high percentage of sugar, and with such substantial structures as are seen in the Condong, Broadwater and Harwood sugar-mills, situated respectively on the three rivers above mentioned, the sugar industry may be safely regarded as both a lucrative and a permanent one. Endeavours have been made by enterprising individuals to grow sugar-cane on the Macleay, Hastings and Manning Rivers, and while there were isolated and sheltered portions where it grew fairly well, no considerable area could be planted on account of the winter frosts. The density of the cane was also affected considerably by the lower latitude, and so it came about that those who endeavoured to launch cane-growing in a commercial manner were heavy losers financially.

The investigations of the chemists at the mills, determined by exhaustive analyses extending over different periods of the year, and with canes at various stages of growth, revealed many phenomena. From these it became evident that as there were great differences in the weights of cane yielded, there were equally as striking differences in the values of these canes from a sugar-content point of view. It was further noticed that the continuous cropping of land, without rotation, fallowing or systematic manuring, was also responsible for great variations in yield and quality. As with many other plants, such practices resulted in the deterioration of the vitality to such an extent that varieties "ran out."

It was the practice, therefore, at all of these mills to conduct experiments to maintain and improve varieties of proved merit; and from time to time new varieties or crosses were introduced, with the object of enabling farmers to secure varieties best suited to their conditions, and for sugar production generally.

Sugar-cane, being a tropical plant, loves a deep rich soil, with abundance of heat and moisture, and, given these conditions, certain varieties were capable of yielding as high as 100 tons of clean cane per acre, fit for the mill. Although the majority of the varieties under cultivation were able to stand a few light frosts without serious harm, it must be stated that many or severe frosts were decidedly harmful, and occasionally it happened that unduly severe winters were responsible for killing out completely certain areas. In order to combat these troubles, endeavours were made to secure a variety that, while it embodied all the desirable qualities of a cane, would be able to withstand frosts. If such could be procured, the area upon which cane could then be grown would be vastly extended, and the sugar output correspondingly increased. Accordingly, a variety known as China Cane was introduced. It developed a large number of thin stalks, was exceptionally hardy, withstanding frosts better than all others; but it did not become popular with growers on account of the extra labour involved in trashing (*i.e.*, the removal of the dead leaves from the stalk) and the lighter yields obtained.

The value of sugar-cane as a fodder was, however, well known. During the cane-cutting season, which usually extends from July to December, the leafy tops that were cut off in preparing the cane for the mill formed almost the sole food for the horses or bullocks that were employed in hauling the loads. They did well, stood the work as if fed on a grain ration. and finished the season in good condition and with sleek coats. A peculiar characteristic of cane is the unmistakably strong breath which it imparts to bullocks, which, to say the least, is most objectionable. On most of the cane farms, portions of standing cane are usually reserved for winter feed, and on account of the somewhat hard and woody nature of the canes, the usual practice is to chaff them prior to feeding.

With the advent of the dairy industry, and the gradual stocking up of the farms, it soon became apparent that something would have to be done to counteract the shortage caused by the failure of the *Paspalum* pastures to maintain their reputation during the winter months. Sugar-cane was tried, and although it could not be stated that it improved the milk flow, it kept the animals in condition; and in dry and severe weather, that in itself was of immense value. Similarly, cane was fed to pigs, with equal benefit.

As the results of feeding ordinary sugar-cane were disseminated amongst stock-owners, cane was planted on many farms expressly for stock food. A couple of droughty seasons, in which many dairymen were heavy losers, gave an impetus to this new departure. Amongst those planted was Indian cane, specially suitable on account of its large number of thin stems, and amount of leaf.

The Introduction of Indian Cane.

Regarding the introduction of this plant, Mr. A. H. Haywood, Manager of the Grafton Experiment Farm, states in an article in the *Agricultural Gazette*, vol. XXII, page 79 :—

> Information has been supplied by Messrs. McInnes Bros., of Ashby Island, Clarence River, to the effect that they were instrumental in introducing it under the following circumstances :—About twelve years ago an Indian employee named Omrah Chand told Mr. McInnes that they grew cane in India that would grow higher in twelve months than China cane would in two years. Chand was asked to produce some plants, and he wrote home and had two plants of the variety sent out by post. These upon arrival here were very dry, but were soaked in lime-water for a night before planting, and subsequently grew.

The Range of Indian Cane.

Indian cane has proved itself in its adaptability to a variety of both soil and climatic conditions to be suitable for growing over a great portion of the North Coast. Excellent results have been obtained as far south as Gloucester, and in a few well sheltered situations on the Hunter. It is a perennial plant, which is propagated by "sets" (portions of cane having several eyes or buds), and grows to a height of from 10 to 14 or 15 feet, according to situation. The stem or cane is composed of a series of joints or nodes, at each of which is a bud or eye. Under normal conditions these buds do not sprout unless the canes are broken down and come in contact with the soil, or unless the dead leaves which encase them are kept moist for an unusual length of time. As the plant grows the lower leaves die and many fall off, or, as is usually the case, they are kept supported by the mass of other leaves and numerous stalks that come from one root. The stems are usually somewhat yellowish in colour, slender and much softer than those of the average variety grown for sugar. At the same time the outside casing is somewhat hard and woody, and this fact must be borne in mind when much of it is fed to stock. At the top of each plant are to be found several pairs of long, narrow pale green leaves.

The canes and leafy top form a valuable stock food. Unlike maize and other crops that die off upon reaching maturity, cane always remains green, so that if at any particular time of the year it is not required to be used it may be allowed to stand without danger of deterioration.

It prefers a deep, rich, well drained soil, situated in a locality where there is abundance of heat and plenty of moisture. The steamy conditions which are so prevalent on the coast suit it admirably. At the same time it will succeed well on hill lands situated some distance from the rivers, provided it is protected from undue exposure. Though the cane is able to stand a fair amount of frost, it must be distinctly understood that it will not stand very heavy or continuous frosts. Slight frosts will probably do little more than check the growth. Heavy frosts will kill the leaf development, whilst a continuance of very heavy frosts will completely destroy the plant.

The past two winters have demonstrated these phenomena clearly; and cases have come under the writer's observation where cane which has been growing in exposed situations on the Clarence and Richmond subject to severe frosts has been checked in growth and completely killed out, while in sheltered localities no harmful results were noticeable.

These facts should be borne in mind when selecting land to be planted, particularly in the southern districts. The plantings should be kept in the higher lands if possible, and special care taken to avoid depressions or hollows that are frequently met with on our alluvial farm areas. Numerous instances have come under notice where cane was completely killed in such depressions by frosts, while that adjacent to it on land only a few feet higher was scarcely affected. In hilly situations preference should be given to easterly, north-easterly, or northerly slopes, so as to obtain the maximum of heat and the necessary protection from fierce cold or dry westerly winds. Any little consideration that can be given in this direction will be amply repaid by increased returns.

Preparation of the Land.

The land should be ploughed at least 10 or 12 inches where practicable. Cane is a gross feeder, and as one planting occupies the land for a number of years, more attention should be given to this operation than for a crop that matures in a few months. Its drought-resisting qualities depend in no small measure upon the development of a deep root-system, and this development should be encouraged in every possible manner, by having the land in good heart and properly prepared.

In timbered areas, such as are found in the soft-wood scrubs or in partially cleared areas, it is advisable, after brushing and felling the scrub, to get a clean burn, and then planting can be proceeded with. using the mattock, a specially-constructed grubbing hoe, or an old adze to make the holes to receive the sets.

On stony headlands or spurs, hand labour has also to be resorted to, and it is surprising how the cane thrives in such situations, provided, of course, that there is a reasonable depth and quality of soil.

Time to Plant.

Cane can be planted at any time during the spring and summer, from, say, September till January, but it is preferable to have the planting done during the first hot month, usually October. If planted earlier, the somewhat cold nature of the soil does not admit of quick sprouting, and the spring showers favour a more rapid weed growth. It must have plenty of heat in order to promote quick growth, which during the early stages of the plant is always more or less sluggish. Late plantings do not admit of the plant making too much headway before the cold wintry conditions set in, and being more tender at this stage, it is not able to withstand such adverse conditions as could be borne by an older plant.

Planting.

Cane is propagated by sets. These are portions of the cane containing several eyes or buds. In the choosing of sets, due regard should be paid to the selection of well grown stalks having large and well developed buds. There should be at least four sound buds to each "hole." The buds are arranged alternately on the nodes, and the roots of the future plant start out from all round the nodes. During growth these buds are protected by the dead leaves which may not have been removed, but it is not absolutely necessary to remove these at planting time unless it be to examine the buds. Otherwise such leaves afford protection from any injury that may occur in the ordinary handling and planting of the sets.

The sets should be planted fairly deeply, but only covered with a light layer of fine soil, so that they will get the full amount of heat to start sprouting. As the plants grow, the earth can be gradually drawn in around, and brought to the level of the surrounding soil, which will also smother any weeds at the same time. Shallow planting is not favourable to free stooling; droughty conditions affect the crop more readily, and it is more likely to break down with its own weight, or the effect of winds or storms. Hilling can be carried out to remedy some of these evils in affording the necessary support, but in naturally open or porous soils, or those situated on hillsides, this practice cannot be recommended.

The distance at which the sets are planted varies with different growers, and a good deal depends upon the situation and fertility of the soil. In addition, close planting tends to develop longer and thinner canes than wide planting, and is considered of some importance when the product is not chaffed before feeding. In general practice, however, it is found that the best results are obtained by planting the sets 4 feet 6 inches or 5 feet apart each way.

On level land free of obstacles, it is advisable to plant on the square system. This is done by laying the land off in checks, 4 feet 6 inches or 5 feet apart each way, by striking out shallow drills, working up the soil at the intersection of these drills with a hoe, and planting the sets. This method enables the land to be cultivated or ploughed each way afterwards.

Regular and constant cultivation is required while the crop is young, particularly to keep down weed growth, and also to bring about those favourable soil conditions that proper and systematic cultivation ensures. After a few months' growth the leaves of the rows should overlap, the soil between is completely shaded, and the crop looks after itself.

Cutting.

With an October or November planting the crop should be fit for feeding to stock by the following winter, when there should be no difficulty in getting from 20 to 30 tons per acre. In particularly favoured situations, as high as 40 tons may be obtained from twelve months' growth.

It is most important that the crop be properly cut. The future growth and life of the plant is influenced to a very large extent by the manner in which this work is carried out.

The canes should be cut with a sharp implement (preferably a cane knife) slightly below the surface of the soil. Breaking the canes or cutting with blunt instruments damages the base of the stalks, and the surfaces do not heal as quickly as they should, whilst in addition the bruised or split portions favour the introduction of moulds, &c., which set up decomposition.

It has come under the writer's observation that some people turn stock in a paddock of cane and graze it off. This is undoubtedly done with the object of economising labour, but the practice is one that cannot be too strongly condemned, and nothing is calculated to destroy a plantation quicker than this trampling and constant nibbling. If the crop is not required for present consumption it can be allowed to stand, when it will continue growing. This is a desirable quality differing from most other crops, which usually die shortly after reaching maturity.

A number of inquiries have been received regarding the suitability of Indian cane for converting into silage. Good silage can be made from it, either by itself or in combination with other crops, but as cane always remains green, it is neither necessary nor desirable to go to this extra trouble and expense.

Later Crops.

In the ordinary course of harvesting, most of the dead leaf or "trash will have been removed. The land should then be ploughed between the rows, or well loosened with the cultivator early in spring. As soon as the warm weather sets in the roots will stool again, the young stalks starting from the buds at the base of the old canes, situated below the surface. These will increase in number after each cutting, but will become gradually weaker. The first crop, termed "plant" cane, is usually the heaviest and best, whilst the succeeding cuts, known respectively as the "first ratoon, second ratoon," and so on, become gradually lighter until it becomes necessary to plough the whole area out. However, with ordinary precautions, a good crop of cane will last many years before it has to be replanted.

When the cane has been planted in recently fired scrub lands, it is advisable to fire the refuse or trash. This will enable a large quantity of dead timber and stumps to be got rid of, and also destroy many forms of borers and other insects that are harmful to cane. Where vermin such as hares, rabbits, paddymelons, &c., are plentiful, it may become necessary to enclose the plantation with wire-netting.

The Limitations of Indian Cane

As stated previously, Indian Cane is being grown extensively throughout the North Coast, and quite a number of dairymen, whose spirits were buoyed upon the reputation of this plant, have been disappointed, and in a few instances have condemned it. This only goes to prove that the cane is not understood. Cane contains a large amount of saccharine matter, which tends to fatten rather than stimulate milk production. For the milking herd it is essential that there should be food given rich in protein, such as lucerne, clovers, vetches, peas, &c., but so far very little attention appears to be given to the balancing of foods generally in our dairying districts.

At the same time, if other fodder is not available cane is far better than nothing, and if it does nothing else than pull animals through a somewhat severe winter in good condition, this in itself is a fact that should not be overlooked. In any case, young or dry stock can be fed on this fodder, while any milk-producing foods that may be grown can be reserved solely for the milking herd.

Feeding to Stock.

Indian Cane is specially suitable for working bullocks. In the timber districts the country is not usually of the best for grazing purposes, and it not unfrequently happens that through a scarcity of ordinary or even rough herbage many teamsters are compelled to turn their teams out for a rest during winter months. At such periods the weather conditions generally favour good roads, so that the teamsters are compelled to lose valuable time. The cultivation of cane in favoured situations in many of these localities enables the animals to be fed, and with the wonderful powers of endurance thus obtained constant and profitable work may be engaged in. In a similar manner horses will also work well, but, of course, it is preferable, if very heavy work is being performed, to include a little grain.

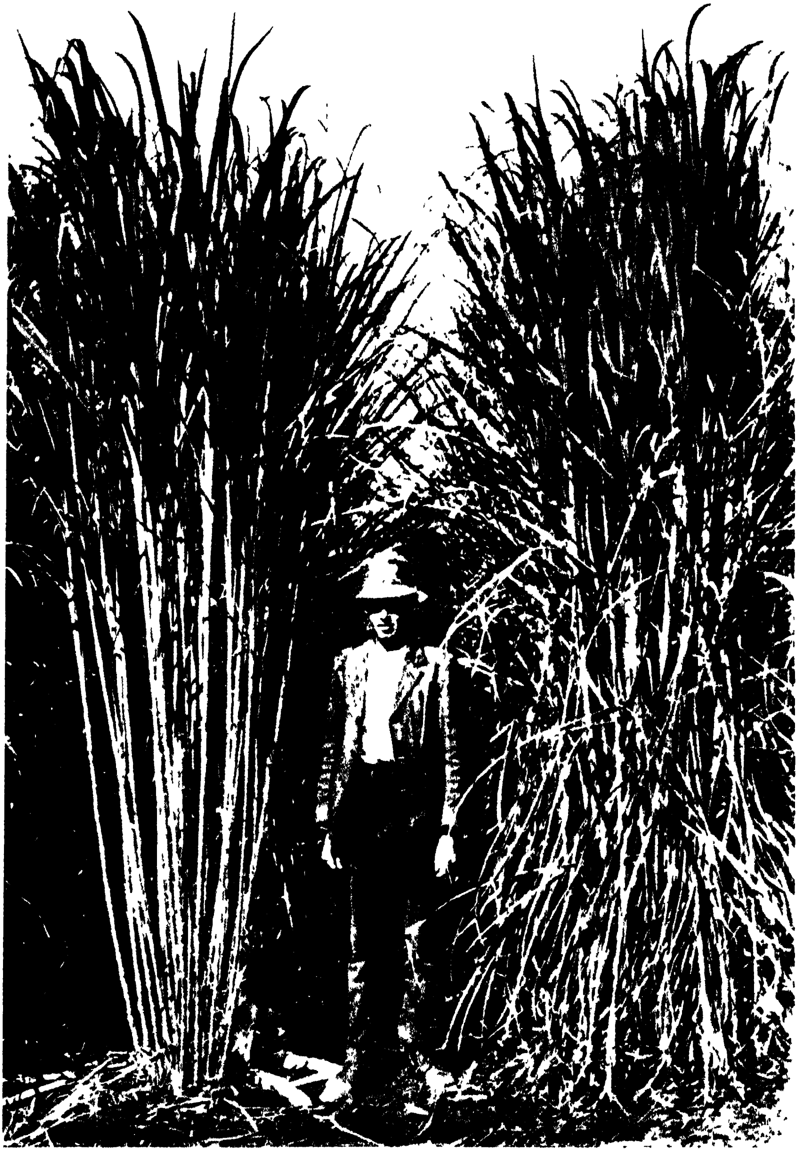
In the feeding of this fodder to stock, however, there are certain dangers which must be guarded against. All well matured cane ought to be chaffed. Though much softer than many varieties of sugar-cane, there is a fair amount of hard or woody fibre, which has a very bad effect upon the teeth of stock. Chaffing minimises this danger to a very large extent. Probably no deleterious results would be noticed in feeding small quantities over two or three years, but, on the other hand, liberal feeding of unchaffed cane over lengthened periods does injure the teeth and otherwise impair the health and comfort of animals.

Instances have been recorded where stock (cows) have been killed through eating cane. *Post mortem* examinations have revealed the presence of large accumulations of undigested fibre. Similar troubles occur in drought times in other parts where animals are forced to subsist on nothing but dry foods. This raises another point of considerable importance regarding the feeding of stock, and that is, that endeavours should be made when feeding large quantities of dry foods or fodder containing much dry matter to have also a liberal supply of succulent material, such as green crops or silage. A mixed diet is always preferable to a single food.

There is another danger associated with cane. There is always a risk of fire from the presence of so much dead leaves or trash. For that reason care should be exercised in the selection of sites, so that they are not situated too close to scrub or other material that may be burnt, or to forest areas that are periodically raided by bush fires. In harvesting the cane also, lighted pipes should be prohibited.

Indian Cane on Mr. H. B. Faviell's Farm, Bonville.

Six months old. Showing how the land is completely covered with leafy growth.



Indian Cane on Mr. H. B. Faviell's Farm, Bonville.

Ten months' growth. 12 feet high. One stool stripped of dead leaves to show the canes, the other stool left in its natural condition.

Summary.

In summarising these remarks, however, it must be admitted that Indian Cane is a valuable fodder plant for the North Coast districts of this State. Though droughts here are not of such long duration as in other parts, they are nevertheless very keenly felt, and all stock-owners would be wise, if their conditions are suitable, to grow a small area as a stand-by. One never knows what kind of season is ahead, and to have something that will tide over such periods when the natural herbage has failed, is certainly a great acquisition.

Dairymen, however, should not grow this in preference to other known crops for the express purpose of stimulating milk production only, or they will be disappointed. But when more intelligence and attention are directed to the nature and composition of stock foods generally, Indian cane will still have its place on the average farm, as one of the many fodder crops that should be cultivated, and if carefully and discriminately used, it will be the means of preventing many losses that want of forethought, neglect, or unforeseen circumstances, unfortunately incur.

RAPE FOR ENSILAGE.

THE difficulty in making silage from rape is that there is too large a percentage of moisture. This can be overcome by putting layers of straw alternately with layers of rape. Mixed with any material of this kind rape makes first-class silage. Rape and barley would, of course, make far better silage than rape alone, but even with a mixture it would be better to add straw or something of that kind in order to absorb the excess of moisture.—GEORGE VALDER.

GUAR (*Cyamopsis tetragonoloba*).

REPORTS on trials with this legume were published in the *Gazette* for November, 1911, page 1000. Further trials have been made at Grafton Experiment Farm, and the Experimentalist has furnished the following report:—

One row was planted on 11th January and another on 12th February. The seed planted on 11th January made the best growth, but only about half the seed germinated. The plants were much dwarfed by the dry weather for the first few months. The plants have now died off, but the seed is soft, and appears to be not properly matured, caused no doubt by the adverse conditions. The plant appears to be suitable for a fodder while it is green. Height, about 18 inches to 2 feet, branching freely if there is sufficient room. The plant bears from 50 to 200 pods, containing about five small seeds.

Experiments with Maize.

FARMERS' EXPERIMENT PLOTS, 1911–12.

(1) NORTH COAST DISTRICT.

GEORGE MARKS, Inspector of Agriculture.

THE maize experiments were carried out this season on the following farms:—

Mr. A. McM. Singleton, Mundrook.
Mr. F. Longworth, Stewart's River.
Mr. F. W. Kemp, West Kempsey.

The experiments embraced trials of varieties for grain, and also green fodder, with and without the addition of fertiliser. On the North Coast maize is grown principally for grain, and late in the season it is planted for autumn and winter green feed. The seasons that usually prevail favour the development of a large amount of stalk, which makes it a profitable crop for conserving as silage; and on the two former plots an extended area was planted so that the produce could be utilised for ensilage.

The rainfall covering the period that the crops occupied the ground ranged from 13 to 15 inches. Though from the total it would appear that there was ample for a good crop, unfortunately the rains did not come at the right time. Something like 10 or 11 inches of the total amount fell at the latter end of February and the beginning of March, after the grain had commenced to ripen. The long spell of hot dry weather that prevailed at the tasselling period seriously affected all the plots, and the low yields are directly attributable to that cause. It is interesting to note that the differences are fairly constant at all the plots.

Grain Trials.

In the grain trials the following were the results:—

Variety.	Mundrook.	Stewart's River.	Kempsey.
	bus. lb.	bus. lb.	bus. lb.
Local Yellow (manured)	49 24	41 29	......
Yellow Dent (unmanured) ...	45 0	44 11	62 48
Yellow Dent (manured)	48 20	45 50	56 0
Golden Nugget „	47 24	43 32	46 0
Early Leaming „	44 4	......	45 12
Funk's Yellow Dent (manured) ...	41 24	42 8	34 40

At each of the places the best local variety was planted so as to compare with the remainder. At Kempsey the crows played great havoc with the local variety, and, as it was situated at the outside, the yields were reduced to such an extent that they could not be considered.

Of the varieties supplied by the Department, *Yellow Dent* easily stands out first. *Golden Nugget* promises well, and should be given further trials. *Early Leaming* is the better of the two last-named early varieties, but seems to be a general favourite for the weevil, and, unless harvested and disposed of immediately it is ripe, soon becomes utterly destroyed by this pest. At Stewart's River the weevil made its appearance weeks before the maize was fit to harvest, and it was not possible to ascertain the true yield. *Funk's Yellow Dent* is not a favourite, and at no time during growth did it look as well as the others.

Regarding the weevil trouble, it was noticed in both the plots and adjacent farms that the late-maturing crops were very free from weevil compared with the early-sown ones. This raises several points worth considering by the maize-grower. On several of the rivers the early-sown maize for the past few years has invariably yielded light crops, through the spring and early summer months being unusually dry. As they mature during the heat of summer, the havoc wrought by the weevil pest renders it compulsory on the part of the owners to place their produce upon the market before it is seriously damaged, and the result is that the farmer has to be contented with the low or normal prices that then prevail. The late-sown crops, however, usually fare otherwise. The monsoonal rains in the late summer favour better returns; the weevil is less prevalent; and the grain can be better stored without much deterioration during the winter months, which enables better prices to be realised.

As a result of observations covering a number of seasons, October is a month that should be avoided for main maize crops. November and the beginning of December are usually considered safe.

Manurial Trial.

One of the Yellow Dent plots was manured with M1 fertiliser, made up as follows :—

3 parts dried blood,
2 parts bone-dust,
4 parts superphosphate,
1 part sulphate of potash ;

and applied at the rate of 3 cwt. per acre. The season was far too dry for the plants to get the full benefit of the fertiliser, and the results are therefore not comparable.

Green Fodder Trials.

At Mundrook and Stewart's River the following varieties were planted for estimating the green fodder yield and for converting into silage:—Yellow Dent, Golden Nugget, Yellow Moruya, Hickory King, Marlboro Prolific, and a local variety. In these trials *Yellow Dent* more than held its own. Compared with Yellow Moruya, the stalks are much thinner, and this is considered important where the maize is fed to stock unchaffed. Moreover, the proportion of hard woody fibre is materially lessened.

Marlboro Prolific did exceedingly well at Stewart's River, where it is considered one of the best for stock feed. It produces a fine quantity of leaf, and there is every indication of it proving to be an acquisition where silage is made.

Notwithstanding the scarcity of feed during the winter months, maize is not utilised as much as it should be for feed, but almost any farm land under ordinary treatment is capable of producing from 20 to 30 tons per acre in normal seasons.

Of the sorghums, *Planter's Friend* is undoubtedly the best for North Coast conditions. It yields a heavier crop than others tried, and though a little later in maturing, it stands a longer time in the field without deteriorating in feeding value.

The soil at Mundrook, where the experiments were planted, is rich alluvial, while at Stewart's River and West Kempsey the soil is slightly inferior.

(2) SOUTH COAST DISTRICT.

R. N. MAKIN, Inspector of Agriculture.

A. Grain.

OUT of seven plots of maize sown for grain, four were harvested, but the other three absolutely failed, and one of those harvested only gave an average return of 5⅝ bushels. The failures were due to the dry weather experienced early in the season. The districts south of Moruya suffered severely, and the return from the Bega plot shows the effect of the dry spell.

It is interesting to note that late planting appears to be more effective than otherwise in the ordinary run of seasons on the South Coast. On consulting the records from the Weather Bureau, it will be noticed that the South Coast, as a rule, experiences dry weather conditions during the spring months (September, October and November) more than at any other period in the year. During the past season this was particularly noticeable, and the only crops producing any profitable returns were, in most cases, the later sown ones.

Of the varieties sown, Funk's Yellow Dent and Boone County Special proved two very suitable, quick-maturing varieties for coastal conditions. At a Maize Exhibition, organised by the Dapto A. and H. Association, these two varieties were represented by some very fine cobs, many of the exhibits of Boone County Special—a white variety—yielding over 1 lb. of grain per cob, and returning 85 per cent. of grain to core. On the plots this variety yielded 64 bushels per acre at Albion Park and Moruya. It is a maize that is well worth growing, and farmers who are not prejudiced in regard to white maize would do well to grow this variety for grain.

Second to Boone County in the above-mentioned plots, and also at Kangaroo Valley, came Funk's Yellow Dent—a yellow maize of good quality, and one likely to be grown on a large scale in the near future, on account of its good yielding qualities, early maturity, and even growth of cob. Moruya farmers are growing this variety with satisfactory results, and endeavours will be made to keep the variety pure.

It is appalling to see, on the South Coast, so little regard being given to variety. In one district recently, a quantity of maize—said to be 5,000 bushels—was inspected, and seven different types of maize could be determined on picking up different cobs. The results of the plots are being watched by farmers growing maize on the South Coast, and it is to be hoped that during the next season better weather conditions will prevail.

The following are the returns from the plots harvested :—

YIELD of Maize for Grain, South Coast Plots, 1911–12.

Variety.	Manure.	Yield per Acre.							
		J. Chittick, Kangaroo Valley.		Gus. Keating, Moruya.		Sir W. McMillan, Albion Park.		C. T. Stiles, Kanoona, Bega.	
		bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Early Leaming	Nil.	60	0	39	8	43	28	6	40
,, ...	M1	61	4	40	32	55	0	7	24
Funk's Yellow Dent ..	Nil.	42	48	47	8	50	24	4	0
,, ,, .	M1	55	40	48	48	59	37	3	40
Boone County Special. .	Nil.	31	24	62	0	60	46	5	8
,, ,, ...	M1	34	16	64	28	64	9	6	0
Hickory King	Nil.	22	48	37	24	49	10	6	48
,, ...	M1	26	16	39	8	51	32	5	40

B. Fodder.

Crops sown in the spring of 1911, on the South Coast, met very dry weather, and in many cases were total failures on that account, particularly in those cases south of Moruya. Good rain occurred in parts during December, followed by further falls in February and March, which meant the salvation of the later sown crops. A quantity of maize sown for grain was converted into silage, as there was no promise of it setting its grain, but in many cases the silos are not full owing to the bad season.

The plots were sown early in October. Though the germination was fairly good, the subsequent dry weather conditions had the effect of checking the young plants to a considerable extent. The Dapto plot failed, but the Central Tilba and Kanoona plots were fair, the effect of the manure being marked, and Yellow Dent proving the best variety under dry weather conditions, as other experiments have proved it under better conditions. There is a good demand for seed of this variety throughout the South Coast.

Next to this variety, Red Hogan is suitable for fodder purposes. It is a little slower in maturing, and grows a coarser stalk than Yellow Dent.

Marlboro Prolific does not appear to be a suitable variety for the South Coast, and the same remark applies to Hickory King, except as an early fodder, when Hickory King must take first place. For the colder parts, Bombala, Moss Vale, Mittagong and Robertson, Hickory King may be strongly recommended.

Now that Yellow Dent has proved itself so adapted for the South Coast, a closer study of soil conditions may be made in order to secure greater bulk.

The following are the yields obtained from the plots :—

YIELDS of Maize for Fodder, South Coast Plots, 1911–12.

Variety.	Manure.	Yield per Acre.							
		R. Read, Central Tilba.				C. T. Stiles. Kanoona, Bega.			
		Tons	cwt.	qr.	lb.	Tons	cwt.	qr.	lb.
Hickory King	Nil.	17	2	3	12	17	2	3	12
,,	M1	18	13	1	4	22	17	0	16
Red Hogan	Nil.	19	11	1	20	20	13	1	4
,,	M1	20	8	2	8	25	0	0	0
Marlboro Prolific	Nil.	10	17	0	16	18	12	2	0
,,	M1	11	5	2	24	19	5	2	24
Yellow Dent	Nil.	20	11	1	20	23	9	1	20
,,	M1	22	5	2	24	29	15	0	0

(3) TUMUT DISTRICT.

R. G. RENNIE, Assistant Inspector of Agriculture.

EXPERIMENTS with maize for grain purposes were carried out during the past season on Mr. John Elliott's farm at Lacmalac, Tumut. The site selected for the experiments was part of an alluvial flat, representative of the first-class maize land of the district.

The land was thoroughly prepared by ploughing it to the depth of 8 inches, then harrowing and discing and subsequently harrowing it again. The seed was sown in a moist seed-bed at the end of October, at the rate of 12 lb. per acre, in drills 3 feet apart.

Experiments carried out in previous years having proved that the yield on these rich flats cannot be increased by an application of artificial fertiliser, the experiments this season were accordingly confined to a trial of varieties.

RESULTS.

Variety.	Yield per Acre.	
	bus.	lb.
Funk's Yellow Dent...	68	8
Golden Nugget	61	49
Early Leaming	60	3
Early Clarence	55	52
Early Yellow Dent ...	54	45
Marlboro Prolific	53	17
Hickory King	53	8
Boone County Special	45	12
Yellow Dent ...	35	47

The rainfall during the growing period of the crop, viz., 11 inches, was 8 inches below the average, so that under these circumstances the yield must be considered very satisfactory.

Comparative Ratio of Cob to Grain.

Notwithstanding that every variety was sown under exactly the same conditions, the yield varied considerably, and it is noteworthy that although certain varieties yielded a large quantity of cobs, these cobs when threshed out did not yield as much grain as did a lesser quantity of other varieties.

A very striking instance of this was afforded in the case of Funk's Yellow Dent and the farmers' own seed, Early Clarence. Both varieties, on being harvested, yielded an equal bulk of cobs, yet when threshed there was a difference of 13 bushels per acre in favour of Funk's Yellow Dent. It will thus be seen that in selecting seed the maize-grower must not be guided entirely by size of cobs. A cob may be very large; still it does not follow that it will yield a correspondingly large amount of grain.

The points which should be borne in mind in selecting cobs for seed are:—

(1) Well filled tip and butt;
(2) Closeness of grain in, and also between the rows;
(3) Smallness of core;
(4) Colour of core. Yellow or red maize should possess a deep red core; white maize a white core;
(5) Length of grain.

If possible the selection of cobs for seed should be made in the field before the corn is pulled, and not in the barn or cribs after the maize has been harvested. Healthy, vigorous plants, preferably those throwing out fewest suckers, should be singled out and marked; and from these, cobs possessing the above-mentioned characteristics should be selected for next season's sowing.

Early maturing varieties are better suited for the Tumut district than those maturing late. Funk's Yellow Dent is an early maize—it yielded 68 bushels per acre. Yellow Dent, a particularly late variety, only yielded 35 bushels 47 lb. per acre.

Description of Varieties.

Funk's Yellow Dent.—An imported American variety, very early, slender stalk, bearing cobs of medium length. The wedge-shaped grains are very closely packed on the core, and there are no spaces between the rows. This variety has given consistently good results in the drier areas, and is at present one of the best yielders for grain. As a green fodder maize, it does not rank so high on account of its small growth.

Golden Nugget.—A variety too late for grain purposes in this district. Stalks are rather coarse. The grain is large and flat.

Early Leaming.—An excellent variety for the drier districts, both as a grain yielder and as a fodder maize. The growth is abundant, but not rank; the cobs are long and the grain wedge-shaped.

Early Clarence.—This is a local variety, largely grown on the Tumut flats. It is not a distinct variety, but is the result of continuous selection of the best cobs of the varieties grown in the district for many years. It is a fair all-round maize, but the cores are exceptionally large; consequently the grain yield is comparatively small.

Early Yellow Dent.—This is a particularly early variety, maturing very quickly. It can, therefore, be sown considerably later than most varieties. It is not a fodder maize, and is only valuable as a grain yielder. The cobs are small, but well shaped and filled; the grain is small, round, and full. It is particularly valuable for late sowing in the drier areas.

Marlboro Prolific.—A white variety imported from America. The growth is luxuriant. It has a tendency to produce two or more small cobs per stalk. This is an exceptionally good maize for green fodder or silage, but cannot be recommended for grain.

Hickory King.—The best known of the white varieties. Like Marlboro Prolific, it is more suited for green feed than for grain in this district.

Boone County Special.—An imported American white variety. The cobs are large, well shaped, and filled with deep wedge-shaped grain. This maize promises to be the most popular among the white varieties, and farmers are recommended to give it a trial.

Yellow Dent.—This is a late yellow maize, and not suited for the Tumut district. In other parts of the State, especially those having a large rainfall, Yellow Dent has for years given satisfactory results; but on account of its late-maturing qualities, it is unsuitable for the drier districts of the State.

(4) NORTH-WESTERN DISTRICT.

A. H. E. McDONALD, Inspector of Agriculture.

Location of the Plots.

Quirindi.—J. Perry, Esq., Killara. The soil was alluvial silt, of great depth. It was thoroughly fallowed in preparation for the crop for some months, and was in splendid order to receive the seed. The crop was well cared for.

Tenterfield.—J. Chick, Esq. The soil was of blue granite formation, of average quality and fairly deep. It was fallowed for some months in preparation for the maize, and careful cultivation was given whilst the crop was growing.

Inverell.—G. Arkinstall, Esq. The soil was a medium red loam of basaltic formation. It was fallowed for some time previous to sowing, and the crop was well cultivated.

YIELDS of Maize, Farmers' Experiment Plots, North-western District, 1911-12.

Variety.	Yield per Acre. Quirindi (Early sowing).	Quirindi (Late sowing).	Inverell (Early sowing).	Tenterfield (Early sowing).	No. of Trials.	Average.
	bus. lb.	bus. lb.	bus. lb.	bus lb.		bus. lb.
Funk's Yellow Dent ...	58 45	61 12	7 42	21 14	4	37 14
Early Leaming	57 14	53 0	14 46	16 38	4	35 24
Early Yellow Dent ...	56 36	46 43	17 0	17 14	4	34 23
Improved Yellow Dent ..	40 0	..	2 21	22 0	3	21 25
Hickory King	30 44	..	..	..	1	30 44
Pride of the North ...	..	...	10 29	..	1	10 29

MANURIAL TRIAL.

Manure.	Inverell.	Tenterfield.	No of Trials.	Average Yield.	Increase due to Manure.
	bus. lb.	bus. lb.		bus. lb.	bus. lb.
M1 manure, 1 cwt. .	14 46	17 14	2	16 2	3 35
No manure	12 9	12 38	2	12 23	...

Quirindi Plots.

The results obtained at Quirindi are exceptionally strong evidence of the value of fallowing. They indicate what an enormous amount of moisture may be conserved in the soil when methods of cultivation are followed which produce and preserve that condition of the surface which checks the loss of moisture by evaporation. The highest yield, that of 61¼ bushels per acre, was from a crop sown at the beginning of January, which matured before the end of April, during which time the recorded rainfall was only 486 points. This is a yield which could be considered very good anywhere, and that it should be produced under the climatic conditions which prevailed this season at Quirindi is most remarkable. It is safe to say that such a growth, made during a time of such low rainfall, has been seldom or never equalled before.

Of the 486 points which fell on the crop, 265 points were recorded within six days of the sowing of the seed, so that the crop was practically produced upon moisture which was present in the soil before the young plants appeared.

Theoretically, such a crop could only be produced where the ideal conditions of a very deep, retentive soil with high capillary power existed, which had been thoroughly saturated a comparatively short time before the seed was sown, and where a perfect soil mulch could be maintained. On this plot these conditions prevailed as nearly as they possibly could be found in actual practice.

The soil was a rich, deep, alluvial silt, which had been thoroughly ploughed in August. It was kept in a friable, loose condition on the surface until the end of November, when heavy rains fell and it was flooded. It was in splendid condition to absorb the moisture at this time.

Immediately the surface dried sufficiently to bear the weight of the horses it was ploughed to open it up after the compaction caused by the water. The surface was kept loose until 2nd January, when drills were opened out about 4 inches deep and the seed dropped. Next day about an inch of rain fell, and the ground was immediately harrowed. About four days afterwards about an inch and a half more rain fell, and as soon as the surface dried it was scuffled. At this time the subsoil was in a saturated condition, and the surface was splendidly mulched with loose earth.

From this time onwards ideal conditions for the conservation of moisture prevailed. The weather remained comparatively calm, though hot, and no rain fell to interfere with the earth mulch. As the yield ultimately proved, practically all the moisture in the subsoil must have passed through the tissues of the plant.

The remarkable results can only be ascribed to the fact that the soil had been prepared to receive moisture, and after that moisture had penetrated the soil and subsoil, measures were taken to secure, by surface cultivation, that condition and arrangement of the soil particles which would tend to check its loss by evaporation. Another crop grown not very far away, on practically the same class of soil at the same time, but without the same careful handling of the soil, failed—thus indicating how potent a factor was cultivation.

Inverell Plots.

The results from the Inverell plots illustrate the necessity of selecting a suitable variety, and of timely preparation of the soil, combined with careful cultivation whilst the crop is growing. From Early Yellow Dent, a quick-maturing variety, a very fair yield was obtained; while from Improved Yellow Dent, a large late corn, practically nothing was harvested.

The rainfall during the growing season was extremely low for the Inverell district, while owing to the paucity of the rainfall during the months preceding sowing, the subsoil was in most cases in a very dry condition. Generally the crops in the Inverell district were practically failures, and fair yields were only obtained from suitable varieties on the experiment plots, and on one or two farms in the districts where practically the same careful system of soil culture was followed, and varieties of a suitable kind used. The results from the experiment plots, above all, indicate the necessity of having the land well prepared some time before the crop is sown. The subsoil then absorbs any rain that falls, and cultivation prevents its loss.

At Inverell, the early varieties gave the best yields. Funk's Yellow Dent should have behaved better, but it was handicapped by being on a piece of unfavourable soil, where couch grass was bad.

The use of fertilisers resulted in an increase of about 2½ bushels being obtained. The soil is of a light character, and differs from most of the soil of the Inverell district, which is mostly heavy. The evidence indicates that fertilisers will be found useful on this class of soil.

Tenterfield Plots.

Here, again, the fair yields (for the season and district) must be ascribed to the careful cultivation. Indeed, too much stress cannot be laid upon the necessity for this. That the yield can be largely increased on nearly every farm in the north is clearly proved by these experiments. In every district it is found that some good results are obtained, even in bad years, and when these are investigated they are found to be due to superior cultivation.

At Tenterfield, Yellow Dent gave the best yield; this was owing to the fact that the season was abnormally mild. Under ordinary conditions, it would have been too late to have matured. The early-maturing varieties are undoubtedly best suited to this district.

A good deal of damage was done by Dry Rot (*Diplodia zeæ*). This is becoming a very serious disease of maize at Tenterfield. A mould forms beneath the husk on the grain which may partially affect a few grains, or the mould may be slightly present on all the grain; while in extreme cases the whole of the grain on the cobs is badly affected, and forms a rotten mass.

The yield of maize in the Tenterfield plots is the total yield per acre, including the grain damaged by mould. The mouldy grain was separated as unsuitable for market, and can only be used for pig and poultry feed after boiling.

The following table shows the proportions of sound and damaged grain, and indicates the seriousness of the disease:—

Variety.	Sound Grain per Acre.		Damaged Grain per Acre	
	bus.	lb.	bus.	lb.
Improved Yellow Dent	16	0	6	0
Funk's Yellow Dent	14	44	6	26
Early Leaming	13	0	3	38
Early Yellow Dent	9	48	7	22
Early Yellow Dent—No manure	7	52	4	42

The disease is serious, not only on account of the actual loss of grain, but because it prevents the use of that labour-saving machine, the husker and sheller. The presence of mouldy grain destroys the quality of the maize, as it is claimed to be poisonous to stock, and admixture must be prevented. Since the affected cobs cannot be detected until the husk is taken off, the husking has to be done by hand. All varieties seem to be more or less affected, and the proportion of loss is practically the same on manured as on unmanured land, while the disease occurs on virgin land, on land where a rotation is practised, and on land cropped with maize the previous season.

General Remarks.

The season generally was of a very unsatisfactory nature, being one of the driest experienced for many years. A fair fall of rain occurred in November, but in the critical months of January and February very little fell. The crops got a fair start, but languished for want of moisture. Extremely high temperatures prevailed, and caused the plants to rapidly parch up. Further, owing to the shortage in the rainfall during the previous winter and spring, even that land which was well and intelligently worked did not contain a very great reserve of moisture. It was only from land that had been fallowed to some extent that any yields were obtained The supply of moisture was quite inadequate on other land to enable the crop to produce more than 3 or 4 bushels per acre. Land of good water-holding capacity, well cultivated, gave a fair crop at least, which, at the prices ruling, was almost as profitable as good yields in any ordinary season.

Even by good cultivation, however, fair yields are unobtainable unless the soil is of a favourable nature. At Little Plain, near Inverell, an experiment plot was established. The soil was of a light and very free character. It had been well prepared, and the maize grew rapidly at the start, but the reserve of moisture seemed inadequate, and the crop began to wither before cobs developed. The free availability of the moisture at the commencement seemed to induce a somewhat rapid growth, which was susceptible to heat.

Further, the experiments showed that to obtain good yields suitable varieties must be selected. In New England and the North-west the late-maturing sorts are altogether unsuitable. The early-maturing varieties only should be selected, and even these vary largely in their suitability. Early-maturing sorts which bear large cobs appear to be most suitable. Funk's Yellow Dent and Early Yellow Dent bear such cobs, and it seems desirable for maize-growers to use these varieties.

Each district where maize has been grown for any length of time has its own varieties developed locally, and these generally are good sorts. They seem to have fitted themselves to local circumstances. The two varieties mentioned, however, appear to have higher yielding capabilities than many of the acclimatised sorts.

It is certainly advisable for farmers in maize-growing districts in the North, who desire a change of seed, or farmers in any of the inland districts where maize is not commonly grown, who desire to try the crop, to secure one of these two varieties.

The selection of a variety of maize is of even greater importance than the selection of a variety of wheat. The climatic conditions of the different portions of the State where the latter crop is grown bear a certain similarity, and it may be said that, given good cultivation, a payable yield may be expected from any variety. It is not so with maize. It is grown very largely, both on the coast and in some of the inland and tablelands districts, and therefore under climatic conditions which differ enormously.

The importance of selecting early varieties is well instanced at Inverell. At Tamworth also its importance was illustrated. Unfortunately there, however, no yields were obtained. Three varieties, two late and one early, were under trial. The early variety promised very well, but straying pigs reached it, and as it was hidden by the late varieties, their depredations could not be seen until too late. From it a good yield would otherwise have been obtained; but from other varieties, although they grew luxuriantly to over 10 feet high, no grain was obtained.

Taken altogether, the yields are satisfactory, and indicate that in ordinary seasons, by fallowing before sowing and the selection of suitable varieties, combined with the use of fertilisers where such are necessary, the yield can be very materially increased. It would seem also that by such methods, carefully and intelligently practised, maize-growing may be extended to districts in the North-west where the giant cereal is at present very little grown, and is regarded only as a catch crop.

(5) WESTERN DISTRICT.

SUMMER FODDER EXPERIMENTS.

OWING to the extremely dry summer experienced in the Western district, the experiment plots sown for the provision of summer fodders were a failure. However, it is well to bear in mind that, although similar experiments have been conducted annually for the past five years, this is the first failure reported. In view of this, it might be stated that suitable varieties of maize and sorghum can be grown successfully for fodder purposes in the Western districts of the State in average seasons.

BORERS ON GRAPE-VINES.

WE have always found that if grape-vines are attacked by the large weevil borer (*Orthorrhinus cylindrirostris*), they are old and dry, or there is some old timber or dying trees in the vicinity of the vines, in which the grubs of the borers are breeding. Some years ago I found a number of the beetles damaging my roses by clinging round the stems and gnawing off the bark; and on examining the trunk of a Queensland bean-tree that had been cut down for firewood, I found hundreds of beetles coming out of it. At Camden Park a large number of vines were badly infested, and we found the beetles breeding out of a very old hawthorn hedge close to the vineyard. When these old trees were cut down *and burnt*, the beetles did very little mischief. Burn all canes and cuttings from the vines and infested wood around the infested area.—W. W. FROGGATT.

Maize.

[Continued from page 706.]

A. H. E. McDONALD, Inspector of Agriculture, North-west District.

CULTIVATION.

SUCCESS with maize depends more upon the cultivation which the soil receives, both before the crop is sown and whilst it is growing, than upon any one other factor. Unfortunately, however, cultivation does not generally receive the attention it deserves. Stock are often grazed on the paddocks until it is almost time to sow the crop, when the ploughing is done, and after the crop is sown it is left to take its chance. If cultivation is given at all, it is only to kill weeds. These are looked upon as foes; but, indirectly, they are the farmer's best friends. They lead him to cultivate in an endeavour to kill them, and in doing so he works the land in such a way that benefits accrue to him which he sees, but very often does not understand, although generally he ascribes them to the destruction of the weeds.

The Object of Cultivation.

It is somewhat surprising that not only farmers, but in many cases even those who are supposed to teach the farmers, do not give thorough cultivation the credit it deserves, nor understand clearly its beneficial action. The farmer often does not understand the principles which should be the guide in cultivation, and when he does work his land well, he often does it the wrong way at the wrong time. Not understanding the subtle differences, he is disappointed, and remembering only that he spent much labour on the land, he condemns cultivation. Many of the scientists. on the other hand, in a zealous search after hidden truth, overlook the simple fact that after all moisture is one of the most essential factors in all changes—not only the changes in plant-food material by chemical or bacterial means, but most important of all, the change of earthy material into vegetable tissue by the plant itself.

Thus we find virtues ascribed to fallowing and cultivation of the fallow which are certainly created by the practice, but which are only secondary in importance to the value of the moisture conserved. Were it not so, fallowing would have its best effects upon poor soil, whereas it is on rich soil that the effects are most pronounced. In seasons when the rainfall is ample the beneficial effects of fallowing are not so noticeable.

The Great Need of Moisture.

It is not realised generally what an enormous amount of moisture the crop requires to produce a maximum growth. The case is not stated clearly by saying that so much moisture is required to pass through the crop to produce a certain yield, because allowance has to be made for loss by evaporation from the soil. It is very rarely indeed, that sufficient moisture falls during the growth of the crop to produce a maximum yield. For instance, yields of over 40 bushels per acre have been taken off wheat land in this State; but they are rare, not because soils of sufficient fertility are uncommon, but because it is very seldom that the supply of moisture is sufficient. Further, if all the moisture required to produce a maximum crop were to fall while that crop was growing, it would oftentimes have an injurious effect on many soils, through producing a waterlogged condition. It would not be able to get away quickly enough, especially if the ground were quite dry when the crop was sown, for the simple reason that dry ground does not absorb moisture quickly. The full amount of moisture required to produce a maximum crop can, without injurious effect on the crop, only be obtained by conserving a considerable amount before the crop is sown. This will not only be available itself, but it will so have moistened the subsoil that further rain will penetrate freely.

It was stated, when discussing suitable soils, that mechanical texture was of the first importance. Given this and good cultivation, and a reasonable annual rainfall, farmers are likely to have few failures. The texture of the soil and thorough cultivation will do more towards producing a good crop than anything else. Manures are of great advantage; but given a piece of land to work, cultivation should be the first consideration of the farmer. Too often it is neglected, and when the crops begin to get low recourse is made to the manure bag rather than to the plough and cultivator. Many farmers also expect too much from variety—they expect to get a maize or a wheat that will grow anywhere. Soil physics are of more importance than soil chemistry, and cultivation is more potent than variety.

That cultivation in conjunction with fallowing is of supreme importance, is indicated by the results of experiments at Quirindi during 1912. A thoroughly cultivated plot of maize there, grown on well fallowed alluvial land, returned a yield of 61 bushels of grain per acre, with only 486 points of rain during the growing season. The remainder of the moisture was supplied from the reserve stored in the subsoil before the crop had been planted.

Why is it that cultivation is so effective? Simply because it enables the moisture which is precipitated during the period the land is available for the crop to be used most efficiently. It must be noted that the land should be available for the production of a particular crop, either of maize or wheat, not from sowing till harvesting, but from the harvesting of the preceding crop until the harvesting of the crop under consideration. The best use to which the land can be put is the production of crops, and any treatment or use of the soil between the harvesting of one crop and the sowing of the next, should be a means towards ensuring a maximum yield from that crop. It does not pay a farmer, for instance, to graze stock on his maize paddocks until nearly sowing time, and only then commence his preparation.

The Scientific Principles.

How is cultivation effective in preventing the loss of moisture by evaporation? It produces and preserves an arrangement of the surface particles of soil which prevents the upward rise of moisture. Loss of moisture occurs through evaporation, and evaporation takes place chiefly at the surface. If moisture can be prevented from rising to the surface its loss can be checked. Cultivation does this. The moisture in the soil exists as a film surrounding each particle. These particles are very small—a grain of sand is a very large particle—and when they lie close together the moisture passes from one to the other until they are equally moist. If the surface of the soil is compact, the particles lie very close together, and moisture moves freely from one to the other. Evaporation takes place from the surface, and the particles there dry quickly. The moisture then rises up from the wet ones below to moisten the top ones again, and as evaporation is going on all the time, the moisture is always rising up and being lost. If, however, all the particles on the top can be made into little clods—they may be only one quarter inch in size—the water does not readily pass from the wet soil below because of the spaces between the little clods. This desirable condition must be produced and preserved by the farmer.

At the Florida Agricultural Experiment Station it is stated that a period of severe drought was experienced in 1908, and during the latter part of April, "Professor A. W. Blair sampled the soil in a cultivated and in an uncultivated portion of the same field, the two plots being separated by a path 4 feet wide. On the unploughed and uncultivated side the weeds at this time were actually dying out on account of the drought, while on the cultivated side the crop of cotton looked as promising as any need be; in fact, the soil on the cultivated side was moist enough to mould in one's hand, while that on the uncultivated side was as dry as road dust. The last soaking rain that occurred on this land previous to taking the samples was on 7th January, when we had 2 inches of rainfall. . . . Sufficient moisture was retained in the soil to not only keep the cotton plants in a healthy growing condition, but also to have enough water in the cultivated soil, and over and above that in the uncultivated soil, to equal 1¼ inches of rainfall."

Implements.

The chief consideration in cultivating is to see that the soil is kept constantly stirred without going deep enough to cut the roots. Provided that this is done, and that weeds are destroyed, it does not matter what implements are used. Harrows, tine cultivators and disc cultivators may be, and are often all used at different times in the one crop. It is an advantage to have all these for the different stages of work. The best growers use the harrows for a short time after sowing, then go on to the spring-tooth cultivator, and where hilling is required, finish off with a disc hiller, which also cultivates the land. The riding spring-tooth cultivator is one of the best machines for working corn in large areas. It lifts the surface, and pulverises and leaves it in what might be called a fluffy condition. The fine earth trickles down below, while the clods remain on the surface, and when rain falls on such a surface it soaks in rapidly and does not set the land. The spring tines also effectually work out obstinate weeds, such as couch grass.

For the small grower the best implement is the one-horse Planet Junior.

It frequently happens that a day or two after the maize is sown rain falls This compacts the surface and helps the evaporation of moisture, while it may also prevent the young plants getting through. It is nearly always of much advantage to the crop if a harrow is run over such land as soon as it will carry the horses. When the crop is about 6 inches high, harrowing also does much good. It stirs the surface and kills many young weeds. The crop may look a bit tattered after it, but it is not harmed. After this the harrow does not do much good, but the spring-tooth cultivator should be freely used.

When to Cultivate.

It is advisable to start using the cultivator early in the season. It will loosen the top 3 inches, and the corn will not then form many roots there. If the cultivation is left until the crop is nearly half grown, a great many of the roots will have formed near the surface, and these will all be destroyed by the cultivator. This seriously injures the crop, and is the reason why some farmers find that cultivation does harm. It is left too long at the start, and is then done too deeply. At any time shallow cultivation pays best amongst corn, as it forms a suitable mulch and does not sever the roots.

The frequency of the cultivation depends chiefly upon the weather. If it remains dry after the first cultivation, the next need not be done till, say, six weeks afterwards. It is necessary to cultivate after every rain of any importance, even if the work has only just been finished. It is not the number of times that counts, but how effectively the right condition of the surface is maintained. In one season two or three cultivations may be sufficient, while in others five or six would be profitable. Whenever the surface becomes compact, the cultivator should be set to work.

Hilling.

This a subject about which there is a deal of controversy. It is much to be feared that it is done not because reason dictates it, but because our fathers before us did it.

The maize-grower should only hill his crop where there is a danger that it will be lodged by storms. In those districts, or in the seasons when maize grows luxuriantly—especially if the situation is exposed—hilling is advantageous; it braces up the stalk and prevents it falling. Wherever the stalks are short, however, hilling is not only unnecessary but harmful, because roots are cut, and a greater soil surface is exposed to the air, and evaporation takes place more rapidly.

Suckering.

Some varieties send up shoots or suckers from near the roots. These suckers produce no cobs. Many farmers remove them to prevent them robbing the parent plant, but it has not yet been definitely proved that they do harm to the crop. When the cost of the labour required to remove them is considered, it is doubtful if the operation pays. If the suckers are required for fodder and are used for this purpose, suckering is worth doing.

Detasselling.

Another operation which is sometimes advised by maize writers is the removal of the tassels from the alternate rows as soon as they appear. The theory is that the production of pollen is a big drain upon the resources of the plant, and that it is not necessary that every plant should produce pollen. It is considered that half the plants will produce sufficient pollen for the whole crop.

The tassels are broken off by hand as they appear, and as they are not all formed together, the crops must be gone through several times. Experiments which have been made by American growers seem to indicate that detasselling is a profitable undertaking.

(To be continued.)

DESTROYING STUMPS WITH ACIDS.

MR. C. MAUD, Erina, Gosford, informs the Department that a neighbouring farmer has been very successful in destroying stumps with a mixture of sulphuric and nitric acids. In treating a swamp mahogany stump, 3 feet 6 inches in diameter, 6d. worth of acids were put in an auger hole, and in five weeks' time the whole stump and roots had so rotted that they could be knocked to pieces with a hoe. Mr. Maud states that a stump 3 feet in diameter would take about half a pint each of the acids, and a smaller one less. The acids are used in equal quantities, and nothing is added to them. A hole is bored in the stump with a 2-inch auger, deep enough to hold the quantity of acids to be used, and then one acid is poured in and the other added. The hole is then plugged air-tight with a wooden plug. Not more than one pint of acids (half pint of each) would be mixed at one time. Mr. Maud asks whether there is any danger in this, and what it is.

Mr. F. B. Guthrie, Chemist of the Department, reports as follows :—

There should be no risk attending the mixing of the above quantities, provided the sulphuric acid is added to the nitric acid, and NOT *vice versâ*. There is a certain amount of risk in mixing nitric and sulphuric acids on account of the heat evolved and the consequent danger of spirting. There is not likely to be any danger in mixing small quantities in this manner, but with larger quantities the mixture will get very hot on the first addition of the sulphuric acid, and must be allowed to cool before the remainder is added ; otherwise the action will be very violent. Both the acids separately are extremely corrosive, and must not come into contact with the person or clothing. With dry wood, nitric acid forms into nitro-cellulose, which is an explosive, but there is not much risk of this substance being formed under the conditions.

Put the nitric acid in the hole first, then add the sulphuric acid.

Clover in the Corn Belt.

IN the maize lands of Ohio, considerable trouble is found in getting clover to grow, owing to continuous cropping with maize having exhausted the vegetable matter in the soil. Mr. J. A. Drake, of the Office of Farm Management, United States Department of Agriculture, has made a study of the methods which farmers are adopting, and has written Circular No. 111, Ohio Agricultural Experiment Station.

A number of rotations are being practised, and generally a nurse-crop is sown for the clover. Wheat is generally used, but is giving way to other crops, as it is unprofitable on its own account. Rotations described are corn, oats, wheat and clover; corn, corn, wheat and clover; corn, wheat and clover; corn, rye and clover; corn, oats and clover; but only in a few instances is the simple rotation adopted of corn and clover alone. Whether sown in the corn at the last cultivation, or by itself in the spring without a nurse-crop, the simple rotation is seldom found to give a good stand of clover.

There are several methods of sowing the clover with the cereal. Generally the seed is broadcasted in the wheat very early in spring, and the wheat harrowed, either before or after sowing. The time chosen depends upon the soil being in a fit state to harrow, and sowing is often postponed for this. Some farmers use disk or shoe drills for sowing the clover, and this is found to do little or no harm to the wheat. Mr. Drake commends the practice.

The investigations show the enormous advantage of applying farmyard manure or other vegetable matter to run-down soils when a stand of clover is desired. There is a photograph of a field where a farmer spread what manure he had on a patch, and then sowed clover. There is a beautiful stand on the manured patch, but absolutely no clover elsewhere, and a strip of clover shows where the manure waggon went off the field. Some farmers, in order to secure vegetable matter, even cart straw on to the field and spread it evenly over the wheat after sowing. The wheat comes up through the straw, and the clover seed is broadcasted in due course. This laborious practice, however, is only adopted as a last resort, on land so run down by bad cropping that it is a question of doing this or giving up clover altogether.

Cowpeas and soy beans are sometimes grown in rotation before the wheat; and sometimes the entire crop is rolled down and disked, the wheat sown with the disk drill, and the vines left as a mulch for the clover. This is unprofitable, however, unless the pea or bean crop can be allowed to ripen and the seed gathered by hogs.

When rye is sown instead of wheat, a disk harrow can be used to break the ground for the clover, provided the disks are set straight. When oats are used, the ground is rolled after the clover is sown. Oats are not very successful as a nurse-crop—they are bushy, and provide too dense a shade, besides causing the young clover to be exposed too suddenly to the sun when the oat crop is harvested. One good method mentioned is to sow the oats in cornstalk ground. The stalks are broken down and the ground disked, after which the oats are sown with disk drill if possible, and disked in. The clover seed is sown after the oats, and the roller used. This method very rarely ails.

Liming is necessary, if the soil is deficient in this ingredient, and no rotation or method of seeding has been found which will make clover grow well on soil which does not contain a certain amount of lime. But farmers are advised to make little experiments first, to ascertain whether the soil really requires liming.

TRIALS OF RICE SEED.

THE Director of Agriculture of the Central Provinces of India recently supplied this Department with 5 lb. each of seed of Nasik and Raskaddum Paddy rice, which are the two earliest varieties of that region, and are grown without irrigation. The seeds were distributed to the Hawkesbury Agricultural College and Grafton and Wollongbar Experiment Farms.

At the College about $\frac{1}{20}$ acre was sown with each variety on 29th October, 1911, but on account of the extremely dry weather, both varieties totally failed.

At Grafton Farm, four drills of each variety, each 78 yards long, were planted 3 feet apart on 18th December, and tested against four drills of Farm raised seed. The weather was generally dry, with occasional light showers, and for several periods the plants were at a standstill. On 26th February, Raskaddum looked best, the average height being about one foot. The rice received several hand-weedings and numerous cultivations. Eventually, the Farm seed gave by far the best yield—4 lb. seed from five rows; Raskaddum yielded only 11 oz. and Nasik 6 oz. from four rows each. Much of the seed was shrivelled, and would fail to germinate. The plants from the Farm seed were about 18 inches high, Raskaddum 14 to 16 inches, and Nasik 14 inches. The Farm seed was ready for stripping a month before the others. These new varieties, however, are beardless, whilst the Farm variety has mostly long beards.

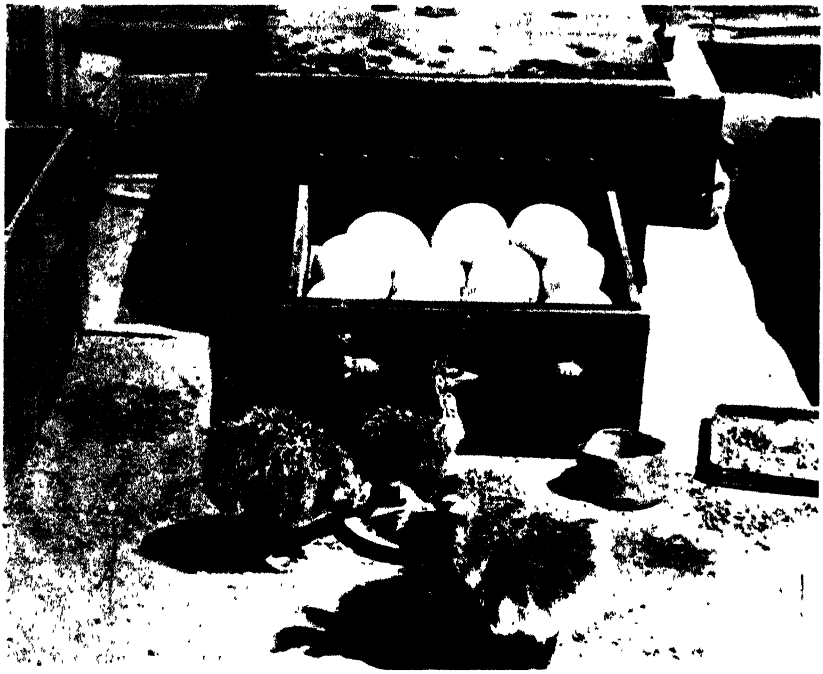
At Wollongbar the two samples were sown on 4th November. When ripe, it was found that the seed had not filled, there being only husks. The season was unprecedently dry, only 5 inches of rain falling in November, December, and January.

A Nest in the open paddock.

Portion of the Main Flock.

"Nardoo" Ostrich Farm, Coonamble.

Photos by Kingdon, Coonamble.



Incubator and Chicks.

Yearling Ostriches.

"NARDOO" OSTRICH FARM, COONAMBLE.

(Photos. by Kingdon, Coonamble.)

Ostrich-farming at Coonamble.

In connection with a recent visit of inspection to the Coonamble Experiment Farm, the Experiments Supervision Committee of the Department of Agriculture had the pleasure of seeing the ostrich farm established by Captain J. E. Cairnes, at "Nardoo," 17 miles from Coonamble, on the Quambone road. This property comprises 7,500 acres, of which some 2,500 acres are devoted to ostriches and the balance to sheep. Captain Cairnes intimated that he receives a greater net profit from the ostriches than from the sheep, though the area occupied by the latter is double the size, and the returns from the ostriches are on account of sales of feathers only. No birds have been sold from "Nardoo," as the numbers have not yet reached the total proposed to be kept. It will thus be seen that this industry is capable of increasing the value of the production of our great western lands. Some of the particulars supplied to the Committee will be given for the information of the public.

Captain Cairnes became interested in ostrich-farming in South Africa. With a partner, Mr. R. B. Sanderson, also formerly of the Royal Artillery, England, he came to Australia, and commenced operations near Gilgandra in 1905. The beginning was made with six pairs of birds, purchased in South Australia. In 1907, when the flock had increased to 67, they removed to Coonamble. The ostriches now number over 400, and the aim is to increase them to 1,000. Mr. Sanderson has since gone out of the business.

An artesian bore provides abundance of water. The country consists largely of a dark sandy loam, different from the stiff black soil which composes the "black soil plains." It is known as "herbage country," and carries very little grass. The chief winter pasture plants are crowfoot, trefoil, wild carrot and parsnip, and a plant known locally as "lamb's tongue"; in summer tar-vine, bull-vine, and the big tufty plain-grass. At the time of the Committee's visit, following upon the winter rains, the whole district was covered with a beautiful green carpet of herbage; and the contented manner in which sheep, cattle, horses and ostriches were grazing upon it, showed its undoubted pasture value. Later on, as the summer heat beats upon the land, this green carpet will disappear, but the "herbage country" always keeps stock in condition, even when there is no feed observable to the untrained eye. At Coonamble, Captain Cairnes was not compelled to hand feed his ostriches at any time even during the recent drought, until a fortnight before the drought broke. At Gilgandra, on grass country, hand-feeding had to be adopted every summer.

It is roughly estimated that land will support three times as many sheep as ostriches. This country is considered capable of carrying a sheep to

2 acres. On 600 acres 100 ostriches can be maintained without difficulty, running on natural pasture alone. But to grow fodders for the birds will certainly enhance the returns, not only by increasing the carrying capacity of the land, but also by giving a better quality of feathers. The better the feeding the better the quality of the crop. Lucerne does very well on the dark loam, under irrigation with bore water. This fodder is rich in protein, and its advantages for the production of feathers are indicated by theory and supported by practical experience. Captain Cairnes has 30 or 40 acres under lucerne, on land which appears to be very suitable for the legume. The crop was sown three years ago, and gives a cut about once every six weeks during the summer. It is given one irrigation to each cut. The quantity of similar land in the district is estimated at about 80,000 acres; consequently the possibilities in this direction appear to be very great. In the past, the limiting factor has been the corrosion of bore casings after a few years service in some instances, permitting the water to escape into drifts under ground and shortening the life of the bores. This problem is being studied by scientists, and it is believed that a solution will shortly be found.

But Captain Cairnes grows lucerne merely as an insurance against drought. The hay is being stored in a shed, and will only be used in case of necessity, the ostriches deriving their subsistence from the natural herbage. When lucerne is to be fed it is put through the chaff-cutter, damped, and mixed with a little bran or maize.

At Coonamble it is not found necessary to give stones to the ostriches. Bones are given occasionally, ground into small pieces.

The birds can be mated for breeding at about the age of three years. The sexes are mated in equal proportions, and the hens lay about sixty eggs per head per annum, nesting in the open paddocks. They lay every second day in the season, but if the eggs are not taken from them they will commence to sit, and the laying will be reduced. One pair of breeders on one acre of lucerne should give at least 30 chicks per annum with natural hatching. Artificial incubation is practised at Nardoo, but Captain Cairnes says natural hatching has some advantages. Nesting commences in July, and hatching proceeds until February or March. It takes six weeks to hatch an ostrich egg.

It is expected, however, that birds penned up will hatch practically all the year round. On an estimate of thirty chickens actually reared each year from each pair of birds, this system should enable the breeding to proceed much faster than allowing the birds to run in the open paddocks. Attention can be given to the chicks, particularly in wet weather, and losses reduced to a much smaller percentage than has hitherto been experienced. The largest hatch so far obtained in one year has been 250, but as many as 50 have been lost in one week from wet weather.

The age to which the birds will breed is unknown. A hen hatched in South Australia in 1893, is still the best breeder at "Nardoo."

The practice is not to pluck feathers from the ostriches until they are nine months old. There is authority for the opinion that it can be done at seven months, but on one occasion Captain Cairnes attempted it at six months and the sockets bled, so that he never got good feathers from those birds afterwards. At about the age of nine months the feathers change, and at about two years the bills and legs of the male birds become pink, but the rate of maturity can be hastened by liberal feeding.

The plucking pens are so arranged that seven birds can be put into a pen together, and then driven one at a time into a "crush," to have the feathers cut. Old birds will stand quietly during the operation, but young ones kick, through being frightened. As a kick from an ostrich is a very vigorous one, a cap is put over the bird's head before it is driven into the crush. Sometimes, when a bird is savage, it is necessary to put the cap on from outside of the pen.

When in the crush one man removes the tail feathers and two others the wing feathers. As the feathers are cut off, no pain is suffered by the birds. It would be against the owner's interests to give pain to the ostriches by pulling the feathers out, as the sockets would bleed, and succeeding crops would be seriously reduced. After plucking, the quills are left for three months to dry, and can then be pulled out without pain to the birds. In the ordinary course of nature the feathers would be shed when ripe, but by that time they would be damaged by exposure and contact with various objects, so that their value would be very much lessened.

An ostrich will give three cuts of feathers in two years—a crop every eight or nine months; but the time can be hastened by liberal and nutritious feeding. It is not advisable, however, to hasten crops. Some South African farmers only pluck once a year. A good crop from a good bird would be 50 quill feathers, besides tops and tails. "Tops" are the three rows next the quills.

In the feather-room the crop is graded for sale. The large snow-white feathers bring the best price—£25 to £30 per lb., or about 5s. per feather. The black and white ones bring about £18 per lb. Black feathers are less valuable. Drabs, from the hens, can be dyed a very pale pink, but they cannot be made pure white. The small "floss" feathers, obtained from three rows under the wing, may be used for various purposes, such as making feather dusters, but are not of much value.

Here, then, we have a fine example of the successful introduction of ostrich-farming into the "land of great distances." The industry is one which requires a good deal of initial capital, but it seems to be eminently suitable for our great western country, either upon large areas as the Merino roams, or upon small irrigated farms in the neighbourhood of artesian bores or other water supplies. Although the world's supplies of ostrich feathers have increased about 66 per cent., prices are far higher than they were eight years ago. The market is enormous, if not unlimited; and the industry has the support of those who rightly condemn cruelty to bird life in the interests of fashion.

A profitable outlet will be found for the immense quantities of lucerne which the interior of this State is capable of producing under irrigation.

In South Africa, £100 to £150 per acre is paid for lucerne land on which to run stud ostriches. One has only to see the lucerne patches upon a few farms and stations round Coonamble to be convinced that lucerne is not going to be confined to the Hunter and the Peel, and the Murrumbidgee irrigation area; it is going to play a prominent part in the peopling of our arid western lands, and it seems a good thing that some of it should go to market in the form of the graceful plumage of the ostrich.

LAND VALUES AND GOOD FARMING.

"THE values of farming land in the wheat areas have an important bearing on the methods of cultivation followed. Throughout the wheat areas, land values have considerably appreciated during the past decade, and this appreciation has been largely due to the increased productive power of the soil, brought about by improvements in cultivation, crop rotation, and in the adoption of artificial manures. . . . . . High though the land values may be, it is certain that they must ultimately continue to rise with the pressure of population, and those who find themselves unable to make satisfactory interest on the enhanced capital values will gradually make way for those who can."—A. E. V. RICHARDSON, in Victorian *Journal of Agriculture.*

SICKLY CITRUS TREES AT HAY.

THE Secretary of the Hay Hospital Committee recently forwarded specimens of orange and lemon leaves and fruit, and stated that the trees set a heavy crop, but the leaves turned colour and fell off, and the size of the fruit was reduced. Mr. W. J. Allen, Fruit Expert of this Department, visited the hospital garden when in the district, and found that the trees were planted on soil with a very stiff subsoil, through which the water passes slowly. As a result, after each irrigation the roots are submerged an unduly long time, and in time become rotten, when the trees assume a sickly yellow colour, carry a heavy crop of fruit and lose their leaves, after which they linger for a time and die. Mr. Allen recommended that the trees be manured well with stable manure and given frequent light waterings during the summer, and the ground worked well around the trees. If possible, a drain, 2 feet to 3 feet deep, should be cut between the rows. This may help to draw off the surplus water, and prevent the soil overlying the clay from becoming sodden.

Potato Experiments, 1911-12.

THE following notes have been supplied by the Chief Inspector's staff, and show results of various experiments with potatoes during the season 1911–12.

A. MISCELLANEOUS TRIALS.

A. J. PINN, Assistant Inspector of Agriculture.

(1) POTATOES FROM SCOTLAND.

When Dr. John Wilson, of the Scottish Agricultural Commission, was in this State he promised this Department some hybridised seed and new varieties of potatoes that he thought would be suitable for our conditions. Both seed and tubers arrived in good order, and were forwarded to Campbelltown State Nursery and Hawkesbury Agricultural College respectively.

The cross-bred seed was sown in pans on 4th March, 1912. The germination was exceptionally good, and the plants made rapid growth. On 23rd March twenty of the most forward plants of each variety were picked out of the pans and placed in pots. In order to protect them from frosts they were placed in a cool frame and covered at night. The seedlings were harvested on 28th June. The result was very satisfactory as regards yield; but the produce consisted wholly of white potatoes. The bulk of the tubers are round, but there are a few fine-looking kidney sorts. The size varies from 1 inch long down to the size of a grain of shot. Of the seven sorts grown the cross-bred No. 125 (British Queen x Myatt's Kidney x Maincrop [2] x New Zealand var. [2]) was the most prolific.

The seven varieties of tubers received were planted on 8th March in a red sandy loam. The season was a favourable one, and no disease appeared during growth. The tops were killed by frost on 17th June, and the crop was harvested on 2nd July.

The estimated yields of the imported varieties were as follow:—

	Tons	cwt.	qrs.
Prior	2	18	1
Rector	2	14	0
Celt	2	9	1
Pict	2	5	2
Kate Kennedy	2	5	0
Mac	1	19	2
Bejant	0	16	0

The two highest yields of local varieties growing in the same plot were:—

	Tons	cwt.	qrs.
Up-to-Date	1	14	3
Manhattan	1	5	0

Description of Varieties.

Prior.—Light yellow, netted skin; eyes wide and of medium depth, situated chiefly at rose end, ridge prominent; tubers roundish, somewhat flattened, and of fair size. A nice-looking potato, which cuts very crisp and white. The tubers are somewhat scattered from the main stalk, and therefore necessitate careful digging.

Rector.—Red, netted skin; eyes of medium depth, crimson, conspicuous just after digging, and situated mostly at rose end. Fairly round, but broader than long; stalk connection at heel end sunken. Tubers of good size, attractive, cutting very white and crisp. The flesh is very close grained, and shows a large percentage of starch.

Celt.—Light yellow, netted skin; eyes very few and nearly all at rose end, very shallow, pink. Tubers oblong, of medium size and slightly flattened. Cuts very white and crisp, and contains a large percentage of starch.

Pict.—Light yellow, smooth skin, with slight pink markings; eyes well distributed, fairly shallow, pink. Oblong in shape. Cuts very white and crisp.

Kate Kennedy.—Yellow, netted skin; eyes fairly numerous and of medium depth; pear-shaped and flattened. Cuts fairly white, but a little soddened.

Mac.—Light red, smooth skin; eyes crimson red, nearly all at rose end. Apical eyes fairly deep, others shallow. Tubers fairly round, of fair size, heel end generally flattened. Somewhat resembles Rector. Cuts fairly white and crisp.

Bejant.—Yellow, netted skin; eyes very few and very shallow, being practically surface eyes, nearly all at rose end; gherkin shape, slightly flattened. Cuts sodden and flesh is very yellow, especially in vascular tissue at heel end. Big percentage of small tubers. This potato has nothing to recommend it on this season's growth.

Seed of all the varieties will be grown from year to year until such time as there is sufficient for distribution, the quantity being at present too small for this purpose.

(2) CROSS-BREDS AT BATHURST AND GLEN INNES.

Work with local cross-breds was continued during the year, but owing to the dry season the increase in the quantity of seed from the various strains was small. The most promising of these crosses is one with Manhattan as a parent, the resulting potato being a good-looking, round redskin, with small white blotches, the eyes being very red and shallow.

Other promising crosses are Red Stem x Blue Derwent and Blue Derwent x Brownell's Beauty.

(3) "SURPRISE" POTATO.

Seed of this variety was sent to five of the Experiment Farms for trial. It is of fairly recent origin, having been bred on the Blue Mountains.

Generally speaking, this potato is likely to be a valuable addition to the varieties suitable for the tableland districts, but on account of being a very late sort, it is not likely to prove as suitable as some of the early varieties, such as Adirondack, for the coastal districts.

All the available seed has been secured, so that the variety can be given a trial in the Farmers' Experiment Plots during the coming year.

(4) NEW ZEALAND VARIETIES.

A considerable quantity of each of four varieties of potatoes was presented to this Department by Mr. H. E. McGowan, South Canterbury, New Zealand, who described them as being the best yielders and blight-resisters in that Dominion. Tests were conducted at four centres, but at three of these, viz., Glen Innes, Bathurst, and Millthorpe, the result was a failure.

The other trial was on the farm of Mr. W. Moore, Senior, Guyra, the yields per acre being :—

	Tons	cwt.	qrs.
Princess Victoria	3	0	1
Willowbridge Wonder	2	16	1
Dreadnought	2	12	2
Early Favourite	0	18	0

These potatoes were grown in comparison with one of our best local varieties, viz., Coronation, which yielded at the rate of 5 tons 9 cwt. 1 qr. per acre. The varieties were manured with our P4 potato manure, and grown under similar conditions. All the potatoes are of good shape and appearance, but are white in colour. With the acclimatised seed now on hand it is intended to give the varieties another trial during the coming season.

As there were no outbreaks of Irish blight during the season, no opportunity was afforded of observing their blight-resisting qualities.

B.—FARMERS' EXPERIMENT PLOTS.

A. J. PINN, Assistant Inspector of Agriculture.

Potato experiments were conducted in various parts of the State during the past season. They comprised trials of eight varieties of potatoes, in addition to manurial trials, the experiment areas ranging from 1 to 5 acres.

Generally speaking, the season was an unfavourable one, being particularly bad in the western districts. On account of the mild attack of Irish blight last year in this division, coupled with the fact that many growers were left with large quantities of potatoes on their hands at the end of the season, they were induced to plant a larger area than usual. The average crop of the division was about 2 tons per acre, of which fully half were spoilt by the larvæ of the potato moth.

The Northern Tablelands experienced the best season, and the returns obtained there should compensate for last season's heavy losses, due to the attack of Irish blight. Some growers declared this to be the most profitable season they had had for many years. The bulk of the produce from this district is absorbed by the Queensland market. The chief variety grown is a blue-skin, locally known as Russell's Seedling, having been produced from seed by Mr. Russell, who is now residing at Glen Innes. This gentleman states it to be a cross between White Prolific and Black Derwent. During the year this variety was compared with Coronation on the farm of Mr. W. Moore, Guyra, and it was impossible to distinguish them. (Coronation is declared by Mr. Seymour, the Victorian potato expert, to be a sport from White Prolific.)

As a result of the susceptibility of Early Rose and Brownell's Beauty to Irish blight, there was a considerable decrease in the area planted with these two varieties.

Profiting by the experience of last season, large areas were sown in the Crookwell district with Magnum Bonum, this particular variety having proved most resistant to blight during the previous year.

The average yields of the Experiment Plots were as follow :—

Variety.	Number of Trials.	Average Yield per Acre.		
		tons	cwt.	qrs.
Queen of the Valley	18	3	14	1
Manhattan	17	3	8	3
Coronation	18	3	2	3
Adirondack	18	2	18	3
Bliss' Triumph	18	2	18	1
Satisfaction	18	2	14	1
Early Rose	18	2	13	3
Brownell's Beauty	18	2	10	3

It is worthy of note that Brownell's Beauty and Early Rose were again the lowest yielders.

Queen of the Valley has again proved itself an excellent variety, and as a result of its consistently high yields, the area sown with it is increasing rapidly each year.

The following are the average yields in the manurial experiments :—

Manure.	Number of Trials.	Average Yield per Acre.		
		tons	cwt.	qrs.
P4 Manure	18	3	4	2
P1 Manure	18	2	18	3
No Manure	18	2	10	2

The manure mixtures used were as follows :—

P4	4 cwt. sulphate of ammonia.
	13 cwt. superphosphate.
	3 cwt. sulphate of potash.

Applied at the rate of 4 cwt. per acre, at a cost of 31s. per acre.

P1	8 cwt. dried blood.
	8 cwt. superphosphate.
	4 cwt. sulphate of potash.

Applied at the rate of 4 cwt. per acre, at a cost of 32s. per acre.

Last season's experiments proved that the cheaper manure was more efficacious, and as a consequence it was decided to use the P4 mixture throughout the whole of the plots in the variety trials. The results this season have confirmed the experience of the previous year.

(1) SOUTHERN DISTRICT.

Four plots were planted in this division of the State, but one of these was outside the recognised potato belt, viz., at Messrs. Hulme Bros., Germanton. In this experiment there was a test of growing potatoes under straw. The object was to determine whether potatoes could be successfully grown in inland districts, thereby enabling farmers in these districts to grow sufficient for their own requirements, and avoid having to pay the high prices usually ruling in these parts. Owing to the adverse weather conditions the experiment resulted in a total failure. No rain was recorded during the months of January, February, and March.

The experimenters within the potato belt were :—

Mr. O. E Silk, Woodbine, Nimitybelle.
Mr. A. F. Carr, "The Hickories," Chatsbury.
Mr. J. Eisenhauer, Rosewood.

In all three districts the season was one of the worst ever experienced, and the yields were affected accordingly.

Nimitybelle.

At Nimitybelle the plot, which was 5 acres in extent, was situated on a black flat, which during the previous year was virtually a sea of thistles. Unfortunately the germination of some of the varieties, viz., Brownell's Beauty, Manhattan, and Queen of the Valley, was very bad. From the experience of the past year it would appear that in dry years formalin has the same detrimental effect on potatoes that it has on wheat.

Owing to the dryness of the weather, it was not found necessary to spray more than twice. Irish blight did not make its appearance.

The potatoes were the best I have ever seen, and samples placed before representatives of the other Australian States, whilst attending the Agricultural Conference in Sydney, excited favourable comment The tubers were very clean and free from all disease, and there was very little moth. Now that Nimitybelle has railway communication, potato cultivation should extend considerably. Up to the present very few potatoes have been grown. The soil, which is of basaltic origin, is very suitable, and the rainfall is usually certain.

Chatsbury.

At Chatsbury the plot was virgin soil, and was, therefore, somewhat open on account of the undecayed organic matter incorporated in it. This plot is on the edge of a large belt of country, embracing Taralga, which is suitable for potato culture, but, owing to the ravages of Irish blight last season, the area under cultivation this year has been considerably reduced. With the co-operation of Mr. Carr, the Department intended to see what could be accomplished in coping with Irish blight by spraying with Bordeaux mixture, but owing to the dryness of the season only two sprayings were given, and no outbreaks of disease were reported.

The germination of Satisfaction was not very good, and that of Coronation and Queen of the Valley was exceedingly bad. This is to be regretted, as the plants of the latter two that grew did exceedingly well, and they are two of the most promising varieties for the district. This poor germination also interfered with the manure experiment. It was noted in this plot, as in many others, that germination was much better where P4 manure was used.

Rosewood.

This is a coming potato-growing district, and only awaits the completion of the railway line connecting it with Wagga, thus giving the district the principal towns of Riverina as markets for their produce. The soil and climate are eminently adapted for potato-growing, as was borne out by the fact that the yield of the experiment plot in 1910–11 was no less than 32 tons from 4 acres.

The soil varies from red to black, and is of basaltic formation, responding wonderfully well to artificial manuring, as instanced by this and the previous season's experiments.

The plot was planted at the end of December, 1911. Late planting in this district is essential, as late frosts are expected and experienced up to the middle of December. The spring and autumn were the driest experienced for many years, only 3 inches of rain falling between the time of planting and harvesting; still, at the price of potatoes ruling, viz., £10 per ton locally, there was left a handsome margin of profit.

YIELDS of Southern Potato Plots, 1912.

Variety.	Yield per Acre.											
	Chatsbury.			Nimitybelle.			Rosewood.			Average.		
	tons	cwt.	qrs.	tons	cwt.	qrs.	tons	cwt.	qrs.	tons	cwt.	qrs.
Early Rose	2	4	3	5	0	0	2	2	1	3	2	1
Bliss' Triumph	2	10	2	4	7	2	2	2	2	3	0	0
Adirondack	3	1	2	4	1	0	1	17	2	3	0	0
Manhattan	....			3	10	0	2	10	1	3	0	0
Coronation	1	19	2	5	8	2	1	11	1	2	19	3
Satisfaction	0	17	1	4	17	2	2	18	2	2	17	3
Brownell's Beauty	2	10	1	3	18	3	1	8	0	2	12	1
Queen of the Valley	1	10	0	3	13	2	2	11	3	2	11	3
MANURIAL TRIAL.												
P4 Manure	1	10	0	5	8	2	2	18	2	3	5	2
P1 Manure	0	14	0	4	14	2	1	18	1	2	8	3
No Manure	0	19	3	5	5	0	1	3	1	2	9	1

(2) WESTERN DISTRICT.

These experiments were conducted in three different climatic belts, viz.:—(1) Cool (Tablelands); (2) Warm and medium dry; and (3) Hot and dry (Western Slopes); being situated as follows:—

(1) Cool:—
Mr. J. Hunter, Mount Lambie, Rydal;
Messrs. Kelly and Lambert, Oberon;
Messrs. Noonan Brothers, Millthorpe;
A. and P. Association, Orange.

(2) Warm and medium dry:—
Mrs. D. McMaster, Craboon.

(3) Hot and dry:—
Mr. C. J. Maslin, Bogolong, Grenfell;
Mr. W. W. Baird, "Clutha," Dubbo;
Estate of late Major Barton, Maryvale.

Throughout the whole of the West, the season was extremely unfavourable, and was perhaps the worst ever experienced by potato-growers. Not only was the crop small, but the potato moth (*Lita solanella*) destroyed, in many cases, more than half the crop produced.

The plots on the Western Slopes were trials of potatoes grown under straw, in comparison with those grown in the ordinary manner. Those grown without straw produced no tubers, and those grown with straw produced very few, which were small and badly shaped.

The tests on the Tablelands included trials of different varieties, and also of fertilisers.

The Millthorpe plot was on soil typical of the largest potato-growing area of the State, comprising all that country between Millthorpe and Orange, and extending towards Carcoar.

At Orange the plot was on granite soil, chiefly used for growing cereals, and rarely for potatoes. The result was a failure. The potatoes produced were small and few, and were not worth harvesting. The Satisfaction variety appeared to have done best.

Oberon is a district in which the growers cater more for the seed market than they do in any other district of the State. The past season was a very bad one, but slightly better than in the more western districts. This plot gave the best average yield of all the western plots.

The area at Rydal under potatoes is not very large, but could profitably be extended. The results of the last two seasons obtained at this plot compare very favourably with those of all other districts of the West, and there is the advantage of being considerably nearer to Sydney.

Craboon is not considered a potato district. The soil is of too clayey a nature, and the rainfall will only suit the crop in occasional seasons. Last year the crop was a very good one, but this season the yield was poor and the quality of the tubers inferior.

The yields of the varieties were as follow:—

VARIETY TRIAL.

Variety.	Yield per Acre.				
	Craboon.	Oberon.	Millthorpe.	Rydal.	Average.
	tons cwt. qrs.	tons cwt. qrs.	tons cwt qrs.	tons cwt. qrs.	tons cwt. qrs.
Queen of the Valley ...	2 12 3	4 0 0	1 14 1	2 9 2	2 14 0
Coronation	0 18 0	3 13 2	1 15 3	4 1 1	2 12 0
Bliss' Triumph	3 4 1	2 19 0	1 8 0	1 19 3	2 7 3
Manhattan	2 8 2	3 5 2	0 15 1	2 18 1	2 6 3
Early Rose	2 0 0	2 5 0	1 5 0	2 10 1	2 0 0
Satisfaction	2 4 1	2 5 0	0 16 3	2 2 1	1 17 0
Brownell's Beauty ...	0 6 3	1 13 0	1 5 2	2 3 0	1 7 0
Adirondack ...	1 4 0	1 17 0	0 9 3	2 19 1	1 12 2

It will be noticed that the two varieties, Queen of the Valley and Coronation, introduced into the district by the Department, and which proved so suitable last season, have again done exceptionally well, filling first and second places in the trial.

The result from the manurial trials was as follows:—

MANURIAL TRIAL.

Manure.	Yield per Acre.				
	Craboon.	Oberon	Millthorpe.	Rydal	Average.
	tons cwt. qrs	tons cwt. qrs.	tons cwt qrs	tons cwt. qrs.	tons cwt. qrs.
No Manure	0 11 3	2 5 3	1 15 3	2 0 3	1 13 2
P4 Manure	0 18 0	3 13 2	1 15 3	2 9 2	2 4 0
P1 Manure	0 9 2	3 17 2	2 0 3	3 17 3	2 11 1

Although dry seasons are not favourable to the action of manures, it will be noticed that even this year the yields were benefited by their application.

(3) NEW ENGLAND DISTRICT.

A. H. E. McDONALD, Inspector of Agriculture.

THE experiments last season were located at Tenterfield, Red Range, Glen Innes, Guyra, Black Mountain, and Uralla, on the farms of Messrs. J. Chick, Theo. Farlowe, W. Moore, senior, Sharon Collins, and S. C. Browning respectively. These gentlemen conducted the experiments both enthusiastically and efficiently, and it is very satisfactory that in the majority of the cases, although the yields were not so high as last season, the crops were financially a success, and were generally much above the average for the district. At Uralla, unfortunately, the germination was most unsatisfactory, and this chiefly is responsible for the low yields. The matter will be referred to later.

The Soil.

At Tenterfield the plots were located on fairly deep soil of average fertility, derived from blue granite. It had been carefully prepared for the crop, and during the growing period was exceptionally well cultivated.

At Red Range the crop was grown on virgin soil of basaltic formation. It was of good character and well prepared. Cultivation during growth was carefully and thoroughly done.

At Guyra the crop was grown on first-class friable soil, derived from basalt. A number of potato crops had been grown on the soil. It was exceptionally well prepared, and the cultivation of the crop was very thorough.

At Black Mountain the soil was much poorer than the average soil of that district. It was carefully prepared for the potatoes, and the crop was thoroughly cultivated.

At Uralla the soil was of a friable nature and of average fertility, but it was rather dry at the time when the crop was sown. No rain fell for some time afterwards, while the weather was very hot and the potatoes sprouted very badly.

The Season.

Last season was most unsatisfactory for the growth of potatoes. The winter was extraordinarily dry, and thus very little moisture was present in the subsoil when the crops were planted. During the early part of the growing period exceptionally dry conditions prevailed, and although the weather improved late in the season, it was of no advantage to the experiment plots, as these had all been planted early and were too near maturity to be materially affected.

YIELDS of New England Potato Plots, 1911-12.

Variety.	Yield per Acre.																	
	Red Range.			Guyra.			Black Mountain			Tenterfield.			Uralla.			Average.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.
Queen of the Valley ...	6	15	0	4	18	2	2	12	2	3	12	0	0	8	2	3	13	1
Early Rose	6	1	0	4	3	0	2	4	0	2	11	1	0	15	1	3	2	3
Manhattan	5	3	3	3	10	0	1	12	2	2	11	1	1	2	1	2	15	3
Coronation	5	11	2	4	0	0	2	11	1	0	17	2	0	14	2	2	14	3
Brownell's Beauty ...	4	0	0	3	6	2	1	15	2	1	18	2	0	17	3	2	7	2
Satisfaction	4	2	0	1	11	0	1	6	3	2	11	1	0	13	3	2	0	3
Bliss' Triumph	3	0	2	2	6	2	1	4	1	2	4	3	0	18	2	1	18	3
Adirondack	3	9	0	2	0	0	1	5	2	2	9	2	0	9	3	1	18	3
MANURIAL TRIAL.																		
P4 Manure	5	11	2	4	18	2	2	12	2	3	12	0	0	8	2	3	8	2
Pl Manure	6	9	2	3	9	1	2	8	2	3	13	3	0	15	1	3	7	1
No Manure	6	7	1	2	1	2	2	1	1	3	5	3	0	15	3	2	18	1

General Remarks.

The results of this season's experiments, when compared with those of last, which appeared in the *Agricultural Gazette* for October, 1911, are very interesting. The season was exactly opposite in character to that of 1910–11. Then phenomenally heavy rain fell, and during the month of January the sun was rarely seen. The humidity was so great that Irish blight widely prevailed in a most virulent form for a time, and it was only those potato crops which had been planted early and were near maturity when the humid conditions prevailed that gave good yields. As all the experiment plots had been sown early that season, very good results were obtained, while from late crops practically nothing was secured.

During this season, however, very little rain fell during the early stages of the growth of the crops, and they had pretty nearly reached maturity before rain came. At no time during the season were the conditions humid enough to develop Irish blight, and the crops were very free from that disease. Owing to the failure in the rains early in the summer, most of the early crops were poor, and it was solely due to the excellent preparation of the soil and careful cultivation that even fairly good yields were obtained from the experiment plots, which were planted early. Late crops varied from fairly good to excellent. This shows how careful a grower must be in selecting his planting time, and how necessary it is to study the distribution of the rainfall. The results from one year cannot be taken as a guide; experiments must be spread over a number of years before a proper working practice can be thoroughly determined.

During this season the sprouting of the potato sets was unsatisfactory, and very imperfect stands were obtained in most cases. Apparently this was primarily due to a detrimental effect which formalin must have upon the eyes. During the previous season formalin was used, and the potatoes sprouted well; but then the soil was in perfect condition, containing just the right amount of moisture. Sprouting, therefore, took place at once, and probably even weakened eyes were stimulated into life, just as poor shrivelled grain will germinate well when the soil in which it is sown is moist and favourable. At Tenterfield a very good stand was obtained, and it is noteworthy that there the soil was in splendid condition for planting, being much better than on any of the other plots. The planting was also done about three weeks before it was done elsewhere, and just after the seed was steeped. As the seed was all steeped at the same time, treatment had been carried out some time when planting was done on the other plots. Evidently formalin has a bad effect upon the stand unless the soil is in perfect order for planting and the seed is planted immediately after it is steeped.

Different varieties seem to vary in sprouting. Satisfaction, Adirondack, Bliss' Triumph, and Early Rose sprouted badly at Red Range, while all others sprouted well. The last-named variety is well supplied with eyes, but it is a bad keeper, and this was probably the reason it did not sprout well. The first three keep well. and were very sound when planted; but they are very poorly supplied with eyes, and thus have less chance to escape being affected by the fungicide. It is difficult to cut even large potatoes of these varieties, on account of the paucity of the eyes. When the seed was being cut at Tenterfield, a large potato of the Adirondack variety was found which had absolutely no eyes.

During this season fertilisers did not, generally speaking, produce the marked results seen last season. At Red Range this was not so remarkable, as the soil was virgin and derived from a rock formation which is known to produce rich soils. At Guyra, where the soil is derived from a good rock formation, but has been frequently cropped, a very marked increase was produced by fertilisers. It must be noted that here the yields were good where fertiliser was used.

At Black Mountain and Tenterfield the manures caused a slight increase, but the margin was not as great as is usually expected from fertiliser. It, however, left a profit.

At Uralla the fertilisers gave no increase, but the yields there were so low that no notice can be taken of them.

It would seem from the experiments that fertilisers do not have a very material effect in the absence of a good supply of moisture.

(4) SOUTH COAST DISTRICT.

R. N. MAKIN, Inspector of Agriculture.

WEATHER conditions were much against successful work on the South Coast potato plots last season. There were five plots sown. Two of these, Kangaroo Valley and Berry Experiment Farm, were failures on account of too much rain. They came up well, but 6 inches of rain in February, following a dry, hot January, rotted out both crops. The Moruya plot gave the best yields. Had the potatoes come up well, this plot would have given good returns, but it was very patchy, and February rains caused much second growth. The Albion Park plot came up splendidly, and was a picture at the time it started to blossom, but, unfortunately, heavy wind played havoc with the crop in December, and a dry January followed, which entirely spoilt it. The plot at Mittagong experienced dry weather after planting, and made second growth.

Of the varieties sown, one prominent feature on the coastal plots was failure of the well known varieties, Brownell's Beauty and Early Rose, as compared with other newer varieties. Coronation gave a good return at Moruya; it is a late-maturing potato on the South Coast, being the last to mature on every plot. Satisfaction gave some very fair returns, whilst other varieties were only fair.

In regard to the manurial trials, there is not such a marked difference between the unmanured and manured as has been the case on other occasions. This may be put down to the insufficient rainfall.

The plots all through were particularly free from Irish blight, scab, and moth, but wet rot was very prevalent during the heavy rains of February.

YIELDS of South Coast Potato Plots, 1911-12.

Variety.	Yields per Acre.											
	Moruya.			Albion Park.			Mittagong.			Average.		
	tons	cwt.	qrs.	tons	cwt.	qrs.	tons	cwt.	qrs.	tons	cwt.	qrs.
Coronation	6	5	2	1	2	1	2	7	2	3	5	0
Manhattan	4	2	3	1	13	1	1	16	1	2	10	3
Satisfaction	4	0	0	1	1	1	2	11	1	2	10	3
Queen of the Valley	4	0	0	0	18	0	2	9	2	2	9	0
Adirondack	4	5	2	1	0	2	1	19	1	2	8	1
Brownell's Beauty	3	0	0	0	16	1	2	8	3	2	1	2
Bliss' Triumph...	2	9	1	1	10	0	2	3	2	2	0	3
Early Rose	1	8	2	0	18	0	2	5	3	1	10	3
MANURIAL TRIAL.												
P4 Manure	4	0	0	1	1	1	2	9	2	2	10	1
Pl Manure	3	14	1	1	5	2	1	19	2	2	6	1
No Manure	3	11	1	0	11	2	0	10	2	1	11	0

(5) NORTH COAST DISTRICT.

GEORGE MARKS, Inspector of Agriculture.

EXPERIMENTS with potatoes were carried out at six centres on the North Coast, on the following farms:—

Mr. H. J. Singleton, Barrington River;
Mr. A. McM. Singleton, Mundrook, Manning River;
Mr. F. Longworth, Stewart's River;
Mr. E. O. Kemp, West Kempsey, Macleay River;
Mr. H. Purkiss, Guy Fawkes;
Mr. W. G. Johnstone, Myrtle Creek.

Eight varieties were selected for the trials, which comprised ten plots. Eight were manured with P4 mixture, and one with P1 mixture, each at the rate of 4 cwt. per acre. For comparison, one plot was planted without any manure. The sets were planted in rows 3 feet apart, and about 14 inches apart in the rows. The weather conditions at planting time were favourable, and the land at all the farms was in good mechanical condition.

Unfortunately the seed was not all that could be desired, and it was noticed that a large number of the eyes were dead, and where the seed had sprouted, quite a large percentage of the ends were blackened. The seed had been treated with formalin before being sent out. Notwithstanding the care exercised in the cutting of the seed and the discarding of all faulty eyes, a considerable number of the sets failed to sprout after planting, whilst of those which did, there appeared a considerable number of weak sickly plants, which on some of the plots never grew into sturdy plants.

Severely dry conditions shortly after planting did not minimise these unfavourable phenomena. On two farms the experiments were practically total failures, and at another partially so. These were at Kempsey, Guy Fawkes, and Stewart's River respectively.

At Kempsey, the land selected was on the river bank, well drained, but somewhat retentive, and some heavy coastal rains which fell kept up such a saturation that decomposition took place.

At Guy Fawkes, hot dry conditions prevailed until late autumn, and the soil being of volcanic origin and porous, was kept dry during the greater portion of the growing season.

At Stewart's River, though the aggregate rainfall during the growing period appeared good, unfortunately the bulk of this fell too late, causing a tremendous second growth and producing innumerable small tubers of no commercial value. But for this second growth, which affected all of the other plots more or less, there would have been some exceptional yields.

At Mundrook, Myrtle Creek, and the Barrington, there was an exceptionally heavy vine growth, which in several instances attained a length of 7 feet.

On the strictly coastal areas—that is, those situated on the river banks and only 100 feet or so above sea level—the thundery conditions that prevail under normal conditions at the time of maturing invariably give trouble, as the heat and moisture cause the young new potatoes to sprout and grow.

For the foregoing reasons it would not be fair to place too much reliance upon the figures given in the table as far as comparing the merits of the individual varieties are concerned. For the same reasons the result from the use of chemical fertilisers are probably not what they would have been under more favourable conditions, and this supposition is undoubtedly confirmed in a couple of instances, where some at least of the fertiliser was noticed in an apparently unaltered condition when the tubers were being lifted.

But notwithstanding these conditions, there were substantial increases when manure was used at Myrtle Creek and the Barrington. The soils of both places were somewhat similar, though not quite so rich as the average river bank alluvial. The P4 mixture gave the better returns. On the Barrington, where the P1 manure was used, the plot was situated near to the river bank, and it is evident that the dry conditions that prevailed were responsible for affecting this plot more than the others on account of its location.

From the results obtained, however, two varieties, Manhattan and Adirondack, stand out prominently, not only as regards yield but also on account of their shape, size, and general all-round qualities. In the average of the yields the variety Queen of the Valley tops the list. This variety is practically new to the North Coast, and gives every indication of being a heavy cropper. On the Barrington it did exceptionally well, as many as thirty marketable tubers being obtained from one root.

YIELDS of North Coast Potato Plots, 1911–12.

Variety.	Yield per Acre.															
	Mundrook.				Myrtle Creek.				Barrington River.				Average Yield.			
	tons	cwt.	qrs.	lb.	tons	cwt.	qrs.	lb.	tons	cwt.	qrs.	lb.	tons	cwt.	qrs.	lb.
Queen of the Valley	6	9	0	22	4	7	1	12	11	15	1	4	7	10	2	12
Manhattan	9	0	3	6	3	8	3	4	9	2	1	0	7	3	3	22
Adirondack	9	6	2	12	3	6	2	24	7	17	0	8	6	16	3	5
Bliss' Triumph	6	17	3	2	3	14	1	20	7	9	1	0	6	0	1	26
Satisfaction	5	10	1	12	3	7	3	12	6	0	0	24	4	19	1	25
Brownell's Beauty	2	15	0	0	3	4	2	16	8	8	3	24	4	16	0	22
Coronation	8	8	1	16	1	16	2	8	3	10	2	24	4	11	3	16
Early Rose	3	14	2	26	1	2	0	16	5	17	3	12	3	11	2	8
MANURIAL TRIAL.																
P4 Manure	5	10	1	12	3	7	3	12	6	0	0	24	4	19	1	25
No Manure	5	9	0	12	1	19	0	24	4	16	1	8	4	1	2	5
P1 Manure	5	5	0	20	3	0	1	20	3	3	0	24	3	16	1	2

ROTATION OF CROPS IN WHEAT-GROWING.

CONTINUING his series of articles on "Wheat and its Cultivation" in the Victorian *Journal of Agriculture* for August, Mr. A. E. V. Richardson, M.A., B.Sc. (Agric.), Agricultural Superintendent, deals with different systems of rotation practised and advocated under Australian conditions. Bare fallowing before sowing wheat is absolutely necessary in the dry districts, in order to conserve sufficient moisture for good crops; but it destroys the organic matter in the soil, thus reducing its fertility. Some system of maintaining organic matter is necessary in order to keep up the fertility of the soil. Pasturing, rest, or green manuring must be adopted under our conditions of relatively large holdings. Wheat, pasture, bare fallow, is widely practised, but is only well adapted for districts where holdings are large, land cheap, and rainfall scanty. It may not be profitable when the present value of land doubles. In the Wimmera district of Victoria, a rotation largely practised is wheat, oats (for pasture), pasture, bare fallow. This undoubtedly maintains the organic matter in the soil; and though the area under wheat each year is less, the number of sheep that can be kept is greater. Various forage crops, such as peas, rape, rye and vetches, barley, &c., have been grown in rotation with wheat and bare fallow, with striking success, particularly now that the lamb industry is firmly established, but no definite rotation of this nature has been applied to large areas.

In order to determine the best forage crops, and their best position in the rotation for dry districts, a series of rotations have been commenced at Rutherglen, and the monetary net return from each will be determined as accurately as possible. Next year the tests will be extended to drier districts. The next generation of Victorian farmers will, therefore, probably have more exact information to guide them than the present one.

Variegated Thistle (*Carduus marianus*) as a Poison Plant.*

MAX HENRY, M.R.C.V.S., B.V.Sc., Government Veterinary Surgeon.

FOR many years the attention of stock-owners and veterinarians has been drawn to the fact that the variegated thistle (*Carduus marianus*), so commonly distributed in this State, was responsible for much mortality amongst stock, particularly cattle, which offered certain difficulties in the way of explanation.† It was for some time widely held, and generally taught, that cattle would only be harmed by this plant through its fermentation and the production of gas in the rumen—that is from tympanites (hoven); but, as evidence accumulated, it was seen that many cases could not be attributed to this cause, as death occurred so rapidly after ingestion, that sufficient time could not have elapsed for fermentation, nor was there any evidence of tympanites observable. At the same time, other cases were described and reported, in which it was obvious that the cause of death was tympanites, such as might be induced by hungry cattle eating any green succulent food, as lucerne, clover, &c., when in a moist condition.

These results have been for long noted and recorded—for example, in the *Agricultural Gazette* of New South Wales, Vol. VIII, p. 81, where Mr. Maiden, Government Botanist, quotes the Inspector of Stock for Dubbo as reporting heavy losses from tympanites in hungry cattle, as a result of gorging on *Carduus marianus*. Such instances could be readily multiplied. It is, however, those cases of mortality associated with *Carduus marianus*, and not due to tympanites, which are of interest.

Occurrence.

Deaths attributable to this second category appear to follow no definite combination of circumstances, although there are several which seem to have some bearing on the mortality. Notable amongst these is the condition of the plant; for, although it does not appear possible to say that the plant at any age is absolutely safe, yet the majority of cases of mortality not associated with tympanites undoubtedly occur when the thistle has been stunted in the course of its growth.

Again, the condition of the cattle has naturally a bearing on the case, and many stock-owners have, in reporting cases, laid stress on the fact that the cattle were hungry travelling stock or starving stock; but as soon as such cases come to be considered, it is so likely that tympanites is the sole or a contributing cause of death, that it is better to put them aside and to confine one's observations to cases in which cattle in at least fair condition, and neither hungry nor travelling, have suffered. It has also been noted that cattle which have been for some time feeding on thistle become suddenly affected; that cattle on one holding are dying on thistle, whilst on the next holding, also affected with thistle, nothing untoward occurs.

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* Read before the Veterinary Association of New South Wales.

† Horses have not been reported as suffering, but they, of course, would not gorge the same way, nor swallow the thistle in a partially masticated condition.

Nothing definite is known as to what portion of the plant, if any, is particularly liable to be harmful, but the popular idea that the lower part of the stem and the root are particularly dangerous does not appear to be borne out by experience. The thistle is quite good feed in most instances, is harmless when made into silage, and would seem to be safe if cut and dried to a certain extent. Stockmen state that cattle often paw it and break it about before eating it.

Symptoms.

It is generally stated that cattle die suddenly—fall dead—and that symptoms are never shown; but although death is in many cases extremely rapid, careful observation will show some premonitory symptoms, often very marked and diagnostic. When closely watched, affected cattle are seen to mope, and become drowsy; staggering movements are shown; the eye has a peculiar stupid appearance; muscular twitchings are evident; there is more or less frothing at the mouth; and the animal goes down, sometimes before symptoms are sufficiently marked to attract attention, and dies in a condition of coma. It is noteworthy that cattle may be feeding exclusively on thistle for some hours before symptoms are evident.

Post-mortem Appearances.

Nothing diagnostic is obtained on *post-mortem* examination, but in some cases a distinctly inflamed condition of the stomach and intestines is evident. However, as most *post-mortem* examinations in this condition are carried out under unfavourable circumstances, with the animal dead at least some hours, it is possible that a more careful examination of a fresh carcase would reveal more definite lessons.

Cause.

It is very evident that the course of the disease, and the circumstances under which death occurs, bear a close resemblance to mortality due to poisoning by immature sorghum or "blue couch grass" (*Cynodon incompletus*), in both of which instances hydrocyanic acid has been demonstrated as the cause of death.

In a report on thistle poisoning, Stock Inspector Brackenrig (Narrabri) observes that mortality from this cause is more prevalent in a year like the present, when the thistle shoots about March, and then becomes stunted with dry weather. In this respect, and also in the fact that the thistle appears poisonous on some holdings and not on others in the same year, it bears a distinct resemblance to sorghum poisoning. The close resemblance of many of the symptoms in thistle poisoning to those shown in blue couch poisoning has been noted and commented on by Stock Inspector Brooks (Scone); and the following symptoms, given by Professor J. D. Stewart, as noted in cases of death from blue couch, will show the resemblance :—

> In less than an hour, serious symptoms became manifest by the bullock that ate most ravenously. In a short time the other two showed signs of the malady. The first thing noticed was the animal suddenly ceasing eating, and quickly becoming drowsy, then uneasy, looking round to flank, gulping as if swallowing regurgitated fluid, slobbering from mouth, and licking lips; urine voided in large quantities; vision became impaired and head drooped; muscular tremors noticeable on shoulder and thighs; suddenly the animal staggers backwards, goes down on hind legs and falls.

It will be noted that in addition to the symptoms common to both cases, marked disturbance of the urinary tract occurred, but this does not appear to be constant in hydrocyanic acid poisoning, as neither Finlay Dun (Veterinary Medicine, 12th Edition) nor Nunn (Veterinary Toxicology) mention it, nor does it appear to have been noted in sorghum poisoning.

In discussing *post-mortem* findings, the inflammatory condition of the stomach and intestines is again noticed by Professor Stewart in cattle poisoned by blue couch, whilst Nunn quotes Hugounenq as calling attention in cases of prussic acid poisoning "to the condition of the stomach, the membrane of which is congested." Beyond this no lesion appears to be generally observed.

Analysis has so far apparently failed to detect the presence of cyanogenetic compounds in variegated thistle, but from the circumstances surrounding these cases of mortality on thistles, it would appear not improbable that death has been due to prussic acid poisoning, and that the variegated thistle (*Carduus marianus*) plays the same part in the death of stock as is taken by *Sorghum vulgare* when immature, *Cynodon incompletus*, and *Lotus australis*.

Treatment.

In discussing the treatment of stock suffering from prussic acid poisoning, Finlay Dun recommends artificial respiration and the subcutaneous injection of ether, atropine sulphate in small doses, inhalation of ammonia, cold douches, and, as a chemical antidote, a mixture of a ferrous and a ferric salt administered with magnesia or potassium carbonate and forming the insoluble Prussian blue. In addition, Nunn recommends bleeding, since a large amount of the acid is kept in suspension in the blood.

At Muswellbrook, Professor Stewart administered 10 c.c. sulphuric ether hypodermically to two bullocks *in extremis* from blue couch poisoning, both of which recovered completely. The same treatment has been applied to cattle suffering from sorghum poisoning.

Lastly, it has now been used with exceptionally good results in variegated thistle poisoning by a farmer, Mr. Dalton, of Aberdeen, under the direction of Stock Inspector Brooks. Mr. Dalton obtained a hypodermic syringe and a supply of ether, as he was compelled by the dry season to feed his cattle on variegated thistle, and knew the danger of so doing. Shortly after he commenced feeding, three cases of poisoning occurred, showing well marked symptoms, particularly the staggering movements and twitching of the muscles. He then continued feeding on thistle for some time without ill effect. But two further cases occurred, one of which recovered after treatment, but the other, which was *in extremis*, died. At a later period, eight further cases occurred, one cow being so far gone that the ocular reaction was the only sign of life observable. Seven of these recovered on treatment, and in half an hour were able to travel.

The dose in all these cases was 5 c.c., and possibly had the larger dose of 10 c.c. been administered to those *in extremis*, they would have recovered.

Where a syringe and ether can be obtained, this treatment would seem to be both easy and efficacious; but where they are not available, inhalations of ammonia, or if the animal can still be drenched, large doses of aromatic spirits of ammonia or *Liquor ammoniæ*, may be given, with bleeding and forced exercise, if no drugs are available.

A NEW POISON PLANT (*Adonis autumnalis*, L.).

THE Chief Inspector of Stock forwards a report from Mr. Stock Inspector Rees, of Inverell, "that a considerable quantity of this plant was intermixed with lucerne hay, upon which some horses were fed, and they showed illness; in fact two died after feeding on it."

This plant has already been reported as a weed in the *Gazette* of January, 1905, but not hitherto as a poison plant, although it has long been suspected, and by some European botanists distinctly recorded as poisonous.

As far as this Herbarium is concerned, it has only been recorded from Berrigan, 1903; Inverell and Goondiwindi (Queensland border, near New South Wales), 1905; and again Inverell, 1912. It is a plant well known in English gardens as "Adonis Flower," "Autumn Pheasant's Eye," "Red Chamomile," "Red Morocco," and "Rose-a-Ruby." It has pretty red flowers, fine-leaved foliage, and originally in Australia probably escaped from gardens. It was probably disseminated in its present localities in chaff or in dirty seed. It contains a glucoside called Adonin, which appears to be the active poisonous principle. It is so showy a plant that it can easily be detected, and it probably is not very abundant anywhere.

I can only recommend that it be carefully pulled up by the roots before seeding and burnt.—J. H. MAIDEN, Government Botanist.

Poisoning of Stock by Plants.

F. B. GUTHRIE, Chemist.

1. Lotus australis.

It is well known that quite a number of plants (among them some cultivated crops such as sorghum) contain at certain stages of their growth a substance which, in contact with moisture, produces hydrocyanic or prussic acid, one of the most deadly of poisons. To their number must now be added the fairly common plant, *Lotus australis* (var. *Behrii*), known under several names, amongst others "Native Bird's-foot Trefoil," "Wild Lucerne," "Native Lucerne," &c. It grows as a bush up to 2 feet in height; of a greyish colour from the short hairs with which the leaves are usually covered. Flowers vary in colour from white to pink or purplish.

As this plant will be fairly abundant in the course of a month or so in this State, it is thought desirable to direct the attention of stock-owners to its undoubtedly poisonous nature, so that they may be on their guard.

Other plants of this genus have been found to contain the same poison. Messrs. Dunstan and Henry, of the Imperial Institute, London, obtained hydrocyanic acid in considerable quantity on macerating *Lotus arabicus* with water (a plant which has been found to be poisonous to stock in Egypt). Dr. J. M. Petrie (of the Linnean Society of New South Wales) has also found it to be present in all samples of *Lotus australis* examined by him.

Towards the end of last year a number of cases of poisoning of stock were reported from Broken Hill. Samples of *Lotus australis* were forwarded to the laboratory of the Department of Agriculture, and were found on maceration with water to yield ·007 per cent. prussic acid (anhydrous). The plants were identified by Mr. J. H. Maiden as "*Lotus australis*, Andrews, var. *Behrii*."

This quantity is much less than that found by Dunstan and Henry in the Egyptian variety, but, owing to the length of time the plant was in transit, it had sweated, developed moulds and become dry, so that the figure obtained does not fairly represent the composition of the plant in the fresh state. At the same time the quantity of prussic acid found is distinctly poisonous. It is generally considered that the lethal dose for a man is about $\frac{1}{10}$ gramme (a little over 1½ grains) of anhydrous hydrocyanic acid. In the case of the plant examined from Broken Hill, this dose would be contained in 3 lb. of the plant.

2. Sorghum.

Another case of the poisoning of cattle by eating sorghum in an early stage of its growth was reported by the Manager of the Wagga Experiment Farm in December last. Thirty-five head of cows out of a herd of 49 were affected, 30 seriously. Of this number 9 succumbed. The treatment consisted in drenching the affected beasts with the following mixture:—

Aromatic spirits of ammonia	1 to 2 oz.
Nitrous ether	1 to 2 oz.
Water	1 pint.

The treatment is stated to have been successful in all cases in which it was applied before convulsions had set in.

Samples of the food from the paunch of one of the animals and of the green crop on which they had been feeding were forwarded for examination. The fresh sorghum was found to contain hydrocyanic acid in considerable quantities, and the contents of the paunch contained an appreciable amount of the poison.

In this case the cattle had broken into a sorghum paddock, in which they only remained for ten minutes. The animals showed signs of poisoning about an hour afterwards. The nine which succumbed died within two hours of eating the sorghum.

As the toxicity of these cyanogenetic plants varies very considerably according to their age and condition, it is interesting to note that in this instance the crop was in an early stage of growth, having been sown a month previously, and that no rain had fallen for twenty-five days. It is known that the formation of poison is most active in the early stages of the plant's growth, and it cannot be repeated too often that it is dangerous to feed stock on sorghum until the flowering stage. In this instance the cattle had just been taken off stubble.

With regard to the treatment adopted, the Chief Inspector of Stock reports that it was an emergency one, and proved as satisfactory as circumstances permitted.

Treatment.

The recognised antidotes in the case of prussic acid poisoning are the following:—

Subcutaneous injection of 1-60th grain of atropin.
Subcutaneous injection of ether.
A mixture of ferric and ferrous salts with magnesia (as a drench).

The following is taken from Finlay Dun's "Veterinary Medicines, p. 421:—

> Prussic acid is usually so rapidly fatal that the animal is often dead before any remedial measure can be adopted; but so volatile is the poison and so rapidly is it removed from the body—chiefly by the lungs—that if the animal lives for half an hour it will probably recover. Artificial respiration and subcutaneous injection of ether sometimes saves animals that have had lethal doses Cautious hypodermic injection of small doses of atropin sulphate stimulates the cardiac and respiratory centres, and may thus avert mortal paralysis.

Mr. Max Henry, Government Veterinary Surgeon, states that the dose of ether is, for an ox, from 5 to 10 c.c.

New Edible Plants on the North Coast.

B. HARRISON, Cudgera Park, Burringbar, Tweed River.

THE following two papers may be found of value by readers of the *Agricultural Gazette* on the North Coast:—

THE "SNAKE GOURD."

Trichosanthes anguina, Linn.

This plant is a native of tropical Asia, and is cultivated in the Solomon Islands. Mr. Maiden, the Government Botanist, says that "fruit and seeds are very desirable." Through reading a paragraph in the *Bega Standard*, in a description of the Solomon Islands, I was induced to procure some of the seeds, which were kindly forwarded to me by a gentleman at Baniki. In the Solomon Islands the plant is known as the "Guada Bean," but, as it is not a true bean, Mr. Maiden considers that this name should be suppressed. Both the fruits and seeds are edible, and are eaten as are French beans. The fruit is stated to grow 7 feet long, and to form a succulent vegetable sufficient for a meal for half a dozen hungry people.

This vine grows from 15 feet to 20 feet in length, and bears long round narrow fruits, resembling cucumbers, which are most palatable when cut up, or sliced and boiled; or, preserved when young, they make a good pickle. The fruit grows from 3 feet to 6 feet long, and has borne a large and continuous crop with me for several months past, and it should prove a most welcome addition to our other vegetables; more especially in the warmer parts of the States, where other vegetables are difficult to propagate.

When over-ripe, the fruit assumes various colours, principally scarlet, green, and white. The flowers have each five or six white, fringed petals, and possess a rich perfume. It appears to adapt itself to all kinds of soil, but will be likely to succeed best, and prove most satisfactory, where the soil is rich; and wherever maize grows it should thrive well.

"HÉLIANTI."

Helianthus strumosus, Linn.; Syn. *H. macrophyllus*, Willd.

This new and valuable fodder plant, combining qualities of the highest importance to a degree never previously approached by any farm-plant, was originally obtained from North America; and after five years of careful cultivation by one of the leading professors of horticulture in France, has been so developed and improved that to-day its cultivation stands assured as one of the very best food-plants of the future for agriculture.

During the past five years, Hélianti has been subjected to tests by both practical and scientific authorities, who all declare in its favour, and show every belief in its future.

Hélianti is allied to the "Sunflower" and "Jerusalem Artichoke." It makes an enormous growth above ground, attaining a height of 6 feet to 12 feet. It is of branching habit, with large leaves, the flowers being of the sunflower type, though on a smaller scale.

The growth makes excellent green fodder, silage, or hay, and exceeds both in green and dry weight and animal food the best known forage plants, such as clover, sainfoin, &c. The dry weight is exceeded by lucerne alone, the proportion being 24 per cent. in Hélianti and 26 per cent. in lucerne; but Hélianti produces no less than three times the weight of growth per acre.

This result in itself will doubtless assure its cultivation on a large scale as a most valuable fodder crop; but, astonishing as it may seem, only a part of its good qualities are mentioned, for at the same time Hélianti grows a large crop of tubers of extreme value—in weight exceeding that of potatoes per acre several times over, and, indeed, rivalling that of the mangel. These tubers are of the greatest importance for culinary purposes, as they have a large dietetic and hygienic value, and have a pleasant taste, and are very digestible.

It is said that "horses, cattle, pigs, and sheep all eat them greedily, and do well upon them. Horses prefer them to mangels, even when fresh raised. Cows do well and give more milk and butter when fed upon Hélianti, either as tubers, hay, or silage, and the butter possesses the very best flavour, even better than that produced by feeding lucerne."

Pigs fed upon the tubers make the best flavoured pork upon the market. Poultry feed well and fatten quickly upon a mixture of half-cooked tubers and bran.

The analysis of Hélianti tubers is given by an eminent analyst as follows:—Proteids, 5·31; fats, 0·48; carbohydrates, 18·65; cellulose, 1·32; minerals, 1·76; water, 72·48.

The leaves of Hélianti are exceedingly rich, analysing as follows:—Proteids, 3·50; fats, 0·66; total sugars, 0·44; carbohydrates, 13·88; cellulose, 1·67; digestible fibre, 1·25; insoluble minerals, 1·90; water, 76·70.

These leaves do not fall in the driest weather, and no plant appears to stand better extremes of heat and cold, of drought and wet.

It must be borne in mind that you cannot grow heavy crops of both forage and tubers in the same season. If a crop of tubers is desired, then no fodder must be cut, but all allowed to mature. The dense growth will then die back, and the growth of tubers resulting may be raised late in the autumn.

In conclusion, this plant has been very aptly named "Hélianti," which signifies a ray of sunshine.

Utilising the Surplus Lemon Crop.

F. B. GUTHRIE, Chemist.

It frequently happens that the lemon-grower finds himself with a considerable quantity of lemons on his hands for which he can find no profitable use, owing either to a glut in the market, or to the fact that the fruit is of inferior quality. This is particularly liable to happen with the second crop.

A few years ago, attention was drawn by the Department to the possibility of turning this surplus to good account by manufacturing citric acid from it, and several fruit-growers were given an opportunity of seeing the process of manufacture on a small scale in all its stages. It is thought desirable to draw attention to the matter again, so that those who care to take the subject up may have an opportunity of familiarising themselves with the operations involved, and of making the necessary preparation for the present season.

The manufacture of citric acid from lemons presents no difficulties and is well within the compass of any orchardist, no elaborate plant being required beyond a few evaporating and settling pans.

The product is put on the market either as crystallised citric acid or as citrate of lime. Citric acid is used chiefly in calico-printing, in medicinal preparations, effervescing beverages, and in cooking and confectionery.

The local wholesale market price of citric acid, according to quotation published in the *Sydney Morning Herald*, of 13th July, 1912, is 1s. 6½d. per lb. spot.

The first process consists in peeling the lemons and expressing the juice from the peeled fruits. The peel can be utilised for the manufacture of essence, but this involves somewhat more complicated operations.

The lemons are richest in acid early in the season. The juice from choice fruit contains about 12 oz. citric acid per gallon. From inferior fruit, early in the season, about 9 oz. are obtainable from the gallon, but later in the season the acidity is much less.

The next stage is the concentration of the juice. This is done by boiling it in flat pans until it is syrupy. The original juice has a specific gravity of 1·03 to 1·04. It is concentrated until the specific gravity is 1·24. The specific gravity is taken by means of a glass instrument like a lactometer, which floats in the juice, and is provided with a scale, on which the specific gravity can be read off. When concentrated to this point the juice contains about 64 oz. citric acid to the gallon of juice.

The citric acid is now obtained from this concentrated juice as follows:—Finely powdered chalk is made into a fairly thin paste with water in a wooden vat, which is heated by steam, and provided with a revolving beater to keep the contents in motion. The concentrated juice is poured in in small quantities at a time, keeping the mixture well stirred all the time. Each addition of juice causes an effervescence, and the operation is carried on until there is only a slight excess of chalk left—that is to say, until the further addition of juice causes only a slight effervescence, and an addition of more chalk does not produce any effervescence.

The whole is now allowed to stand quietly to cool and settle. The more or less white substance which settles out is citrate of lime. This is itself a marketable commodity, and when dried can be sold to manufacturers of citric acid. All that is necessary is to allow the calcium citrate to settle, pour off the clear liquid, and throw the residue upon a filter, where it is washed with hot water, allowed to drain, spread out on trays to dry, and put up in packages. The citrate of lime so obtained contains about 64 per cent. citric acid.

If it is desired to prepare citric acid from the citrate of lime, the following is the procedure:—The citrate of lime, after having been thrown on a filter as described above, is scraped off the filter and made into a thin cream with water, in a wooden or enamel vessel. Dilute sulphuric acid is now added in slight excess. The action of the sulphuric acid is to convert the lime of the citrate of lime into sulphate of lime or gypsum, which on standing separates out, leaving the citric acid in the clear, supernatant liquid. All that is now necessary is to draw off, or syphon off, this clear liquid, and evaporate it by heating in shallow pans (preferably enamel ones, though leaden ones may be used). At first a further quantity of gypsum is thrown down, and it may be necessary to run off the clear liquid after it has been partially concentrated. The evaporation is continued until a stick dipped in the liquid and taken out becomes immediately covered with crystals. The liquid is now poured out into a wooden tub provided with an agitator, and kept in motion while cooling. This produces fine granular crystals of citric acid.

The "mother liquor" -that is, the liquid which remains after the crystals have separated—is further concentrated by heating and again allowed to crystallise. This may be done two or three times, after which the mother liquor is too dark and impure for further use.

The granulated crystals, which are generally somewhat discoloured, are now mixed, washed with a little water, dissolved in water, and decolourised by the addition of animal charcoal, which has been previously washed with hydrochloric acid to free it from phosphates. After being purified with animal charcoal the liquid is again concentrated to the point of crystallisation, and poured off into shallow enamel (or leaden) trays about 3 inches deep. On cooling, the crystals of the citric acid of commerce are obtained.

The only apparatus required are the following:—

Lemon-peeler.
Press.
Vessels to contain juice.
Flat enamel pans.
Wooden vat provided with stirrer (wood .
Filter or filter-press.
Flat enamel or leaden trays, 3 inches deep.
Tall cylinder and specific gravity float.

The only chemicals required are:—

Finely powdered chalk.
Dilute sulphuric acid.
Bone-charcoal, previously treated with hydrochloric acid.

All the above apparatus and chemicals can be obtained at one of the chemical manufacturing firms in Sydney. The quantities of apparatus and chemicals, and the dimensions of vats, pans, &c., will of course depend upon the quantity of fruit on which it is proposed to operate.

The above description has been made as clear as possible; but, as it is always difficult to explain the details of any manufacturing process on paper, and as an ounce of practice is worth a pound of theory, the Department will be prepared at any time to demonstrate the process if a few fruit-growers express their desire to see the operation. Any party of about half a dozen will be afforded an opportunity of seeing the process carried out in the Chemical Laboratory of the Department on making an appointment a few days in advance with the Under Secretary of the Department of Agriculture.

APPLIANCE FOR CLEANING SEED GRAIN.

MR. G. H. DUNN, of Tamworth, thoroughly removes all black oats from wheat or barley by means of an ordinary wheat winnower, fitted with one special sieve, and a patent feeding appliance of his own. The machine is almost ridiculously simple, yet the seed is freed from black oats as thoroughly as it is by any of the more complicated cleaners or graders. The machine does not grade the seed; it merely removes the oats.

The essential parts of the machine are the patent feeding-apron and the sieve. The feeding-apron regulates to a nicety the amount of grain passing on to the sieve, and no blocking can possibly take place. The sieve is of sheet-iron, and has holes of the right diameter in front, while at the rear it is not perforated. The seed falls on the plain plate, and rolls down on to the perforated section, where the separation takes place. The principle is somewhat similar to that underlying the working of the ordinary screen graders; but the seed is cleaned much more quickly and more thoroughly. Two men can put through a hundred bags a day.

Any winnower can be fitted with the sieve and feeding-apron. An attractive feature is that farmers possessing a winnower can have it fitted at a small cost, so that it will remove all oats from their seed wheat.—A. H. E. McDONALD, Inspector of Agriculture.

Agricultural Bureau of New South Wales.

(NOTES COMPILED BY E. HARRIS.)

Branch.	Honorary Secretary.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Bonville	Mr. H. B. Faviell, Bonville.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *vid* Cowra.
Cardiff	Mr. D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. H. Vickers, Coreen.
Cowra	Mr. E. P. Todhunter, Cowra.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Kareela	Mr. L. Haydon, Kareela.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald. Keepit.
Kellyville	Mr. T. Glasgow, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *via* Inverell.
Lower Lawrence	Mr. E. T. Cooney, Lawrence
Lower Portland	Mr. G. Gosper, Lower Portland.
Mangrove Mountain	Mr. G. T. Hunt, Mangrove Mountain.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *via* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, Penrose.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wolseley Park	Mr. K. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a précis of any paper which may have been read and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Balldale.

A meeting of farmers was held at Balldale on 31st July, when it was unanimously decided to form a branch of the Agricultural Bureau. Mr. T. Wilson is Chairman; Mr. P. H. Howard, Vice-Chairman; Mr. J. Ryan, Honorary Treasurer; and Mr. H. Elrington, Honorary Secretary.

Bonville.

The report of the first year's working of this branch shows that ten meetings have been held, five papers have been contributed by members, and three lectures and one demonstration have been given by officers of the Department.

Bungalong.

A meeting was held in the Bungalong School on the 29th July, at which it was decided to form a branch of the Agricultural Bureau. The subscription has been fixed at 6d. per member, and the meetings are to be held on the Thursday evening nearest the full moon. The Chairman is Mr. D. Bryant; Vice-Chairman, Mr. R. Hughes; Honorary Treasurer, Mr. C. Diprose; and Honorary Secretary, Mr. E. Hughes, of Oakleigh, Cowra Road, *viâ* Cowra.

Coonabarabran.

On the 29th July, it was decided at a public meeting to form a branch of the Agricultural Bureau at Coonabarabran. Some thirty members were enrolled, and the subscription was fixed at 2s. 6d. per annum. Dr. F. G. Failes is acting as Honorary Secretary.

Cowra.

Mr. Veterinary Surgeon Sanderson gave a lecture on the evening of the 7th August on "Horses—Strangles, Influenza, and Tetanus." The lecture was delivered in the local school-room.

Grenfell.

Messrs. W, Hunter, J. Simpson, W. W. Griffiths, and W. Armstrong have joined this branch,

Henty.

A branch has been formed at this place with Mr. P. W. Smart as Chairman; Mr. O. Eulenstein, Vice-Chairman; Mr. McMaster, Honorary Treasurer; and Mr. H. Duffy, Honorary Secretary.

At the initial meeting on the 27th July, Mr. Assistant Inspector Stening was present, and addressed the meeting on the objects of the Bureau and the benefits to be derived therefrom. Meetings will be held in the Public School at 11 a.m. on the last Saturday of each month, and the membership fee has been fixed at 2s. per annum.

Kareela.

A branch of the Bureau has been formed at this place, and the following officers have been elected :—Chairman, Mr. John Mashman ; Vice-Chairman, Mr. Oliver Clews ; Honorary Treasurer, Mr. Alfred Bennett ; Honorary Secretary, Mr. Lionel Haydon, of Kareela. The annual subscription has been fixed at 2s. 6d.

Katoomba.

Messrs. N. O. Johnston, R. C. Sharp, and Rev. J. Hefferman have joined the branch. A meeting was held recently at the Farm Orchard of Mr. C. Wooller, where lessons were given in pruning and orchard work generally.

Kellyville.

Mr. Geo. Bradshaw, Poultry Expert, is arranging to lecture to the members on "Management of Incubators, &c."

Leech's Gully.

The branch has recently been supplied with a sample of Egyptian Clover Seed for trial by the members.

At the monthly meeting on 2nd August, it was decided to apply to the Department for a lecture on "Tuberculosis," and to hold a debate at the next meeting on Dairying and Crop-growing.

Messrs. A. Holly, G. Steed, and W. Jordan were elected members.

Little Plain.

At Mr. Taafe's orchard on the 6th August Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a demonstration in pruning and grafting.

Mangrove Mountain.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a pruning demonstration in Mr. Tange's orchard on the 23rd August.

Milbrulong.

The annual meeting of this branch was held on the 29th July. The following office-bearers were elected for the ensuing year :—Chairman, Mr. J. H. Rodgers ; Vice-Chairmen, Messrs. F. Gollasch, B. A. Cameron, and J. Lynch ; Honorary Treasurer, Mr. W. Gollasch (re-elected) ; Honorary Secretary, Mr. O. Ludwig (re-elected). During the year seven ordinary meetings were held, and there were three lectures and a demonstration by experts of the Department. The membership fee for the ensuing year was fixed at 2s. 6d.

New Italy.

A new branch has been formed at this place with the following officers :—Chairman, Mr. C. G. Roots ; Vice-Chairman, Mr. J. Rosolen ; Honorary Treasurer, Mr. A. Morandini ; Honorary Secretary, Mr. F. A. Morandini. The annual subscription is 1s., and at the initial meeting the Chairman, Mr. C. G. Roots, gave a lecture on "Water Conservation."

Orchard Hills.

Arrangements are being made for the members of the Bureau to pay a visit to the Hawkesbury Agricultural College.

The regular monthly meeting has been changed to the Monday on or after full moon.

Penrose.

A case of insect pests has been made up by the Government Entomologist and forwarded to the branch.

The branch has decided to obtain a rain gauge, in order to supply accurate information in regard to the rainfall for the use of the members.

On the 19th July Mr. J. G. R. Bryant, Assistant Fruit Expert, acted as judge in a pruning competition arranged by the branch. There were some fifteen competitors, and Mr. J. Hughes, of Penrose, was the successful candidate, Mr. J. J. James, of Tallong, being second. The competition was held at Mr. Senior's orchard, and there was an attendance of forty interested people. In the evening a party visited Mr. Hewson's orchard, where tea had been provided by the branch, after which a musical evening was spent.

The paper recently read by Mr. J. Hughes, a member of this branch, on "Spraying Apple Trees" was printed in full in last month's *Agricultural Gazette.*

The regular night of meeting has been altered to the first Saturday evening in each month.

Sherwood.

A branch has been formed at Sherwood, with a membership of seventeen. The officers are:—Chairman, Mr. John Davis; Vice-Chairman, Mr. W. M. Clarke; Honorary Treasurer, Mr. J. S. Dunn; and Honorary Secretary, Mr. J. E. Davis.

Spring Hill.

Mr. Veterinary Surgeon Sanderson delivered a lecture on "Mortality amongst Foaling Mares" on the 25th July, and despite the wet weather that prevailed there was an attendance of thirty in the local school-room. The Hon. Secretary reports that the lecture was most instructive and useful, and the lantern slides which were shown were very interesting. Arrangements are now being made for a second lecture on the subject by Mr. Sanderson, to be delivered on 2nd October.

Wallendbeen.

Arrangements are being made for Mr. Veterinary Surgeon Palgrave to deliver a lecture on "Equine Diseases," on the 2nd October.

Walli.

Walli Branch reports that the members lost a considerable number of stock before the recent dry spell of weather broke. However, since the rain things are flourishing again.

At the meeting held on 10th August there were sixteen members and some visitors present. It was decided to hold a social at an early date.

BAITING FOXES.

THE officers of Wagga Experiment Farm have found that young rabbits just furred make excellent baits for foxes. A small incision is made with a knife in the breast of the rabbit, and as much powdered strychnine as will rest on the point of the knife is put in. These baits should be placed in the neighbourhood of rabbit warrens. Another good bait, at lambing time, is made by splitting the head of a dead lamb, leaving half the brain in each half of the skull, and burying the strychnine in the brain.

Orchard Notes.

W. J. ALLEN.

SEPTEMBER.

Green Manures.—If the green crop has not been turned under this should be done as early as possible, in order that the crop may become well rotted while there is still plenty of moisture in the soil. If such crops are allowed to remain in until the land becomes dry, it will be found almost impossible to plough it, to say nothing of turning them under; and the chances are that, instead of doing good, the opposite effect will result. The moisture, in place of being conserved, will have been taken up by the crop; in consequence of which the soil will have become hardened. When ploughing is attempted, the ground will break apart in lumps, and it will be found impossible to turn the crop under, which will thus dry up instead of rotting, as it should.

Spraying.—If the spring proves to be a wet one, it is advisable to spray trees which have in previous years shown signs of fungous diseases, such as peach curl in the peach trees, black spot or scab of the apple, and shot-hole fungus of the apricot. Bordeaux mixture and lime-sulphur will be found the best sprays at this time of the year for all fungous diseases.

San José Scale.—Should the San José scale put in an appearance after the leaves have started on the trees, the resin, soda, and fish-oil wash will be found the best to use at this season of the year; yet it may damage the fruit a little, unless applied very weak or immediately the fruit has been harvested.

When Not to Spray.—Never spray any trees or vines when they are in bloom, as the chances are that the crops will be destroyed. They may be sprayed a week before coming into bloom, and a week after the fruit is set.

Cultivation.—In all cases, see that the orchard is in thorough condition, as the future crop depends so much on the state in which the trees and soil are kept during the summer months.

Codlin Moth.—It is well to make early arrangements for fighting the codlin moth. It has been proved that four applications of arsenate of lead will control this serious pest. The first spraying should be given just as most of the petals have fallen. This is the most important spraying of the four. The quantity used is 4 lb. to 100 gallons of water. The second spraying should follow a fortnight to three weeks after the first, using 3 lb. of arsenate of lead to 100 gallons of water. Subsequent sprayings may be given at intervals of every three or four weeks, if the moth is bad, using 3 lb. of arsenate of lead to 100 gallons of water. In spraying trees with this, or any other spray, see that a good pressure is kept up, so that the pump will throw a fine mist, and be particular to cover the inside and outside of the tree as well as the whole of the fruit

Late Planting.—It is rather late for planting deciduous trees, even during the earlier part of the month; yet, if they are given special care, such trees and vines may be planted. Careless handling is usually responsible for loss.

All soil should be loosened, either with a fork hoe or chipping hoe, around trees and vines, and all couch grass, sorrel, or other weeds removed and burnt. This work should be carried out in the early spring, while the soil is moist and easy to work.

Late Pruning.—In some districts pruning may not be finished by the beginning of the month; but the work should be completed before the middle of September, if possible.

Cattle at Wollongbar Experiment Farm.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.].

STRIPPER FOR HARVESTING PASPALUM SEED.—"W.T.H.": I do not think there are any strippers on the market of the kind you require, but they can easily be made at a small cost by any blacksmith or mechanic. In New Zealand, to which you refer, much of the grass seed crop is cut with a hook and laid in handfuls on the ground to dry. It is then lifted carefully, and threshed by flailing on a sheet spread on the ground. Small threshing plants are also used where a large quantity is to be handled, but generally the final dressing is done by the seed merchants. Rye-grass is cut with reaper and binder, and afterwards threshed by a machine. In America, home-made strippers are largely used—see illustrations in *Gazette*, August, 1911.—GEORGE VALDER.

LIMING SOILS.—"J.A.H.": Freshly slaked lime is more effective than old slaked lime, or other forms of lime, in coagulating the clay in the soils, thus rendering heavy and stiff soils light and friable, and preventing shrinkage on drying. It has no advantage over other forms of lime, such as mild lime or ground limestone, if it is only a question of sweetening the soil or applying lime to soils poor in this ingredient. Other questions answered by letter.—F. B. GUTHRIE.

FIG-TREE DROPPING FRUIT.—"F.G.W." (Oberon): Two distinct causes may effect the dropping of the figs before they are ripe. The more common is unfavourable climatic conditions, either in general or in particular for a certain variety. This climatic defect may consist in any condition that will temporarily check the flow of sap to the figs. Cold nights, cold winds, and late frosts are equally as effective in causing the dropping of the fruit as are excessive dryness and great heat. Want of moisture frequently causes the fruit to drop or to develop poorly and become tasteless, coarse, and unhealthy. In this case, moderate irrigation may be the remedy. Many varieties will always drop if raised in an unsuitable climate—in such cases there is no other remedy than to experiment with other varieties which may be suited to the climate. As numerous varieties of figs are originated under the most different conditions of temperature and moisture, there are enough varieties to suit almost every locality which can be at all favourable for fig-culture, and perhaps one each of White Adriatic and Brown Turkey might be tried.—W. J. ALLEN.

CULTIVATING AN OLD NEGLECTED ORCHARD.—"J.W.": In the case of an old citrus orchard, it is not advisable to plough too deeply when the cultivation has been neglected, as the trees are naturally shallow rooted, and from neglected cultivation would necessarily be throwing out young fibrous roots near the surface. These are the main agents for absorbing the elements which are used by the plants in their growth and fruiting. Consequently they would be damaged in the deep working, and the trees would suffer.

The deep working of the stone and pome fruits would not cause any appreciable injury if care be taken to work the soil during the winter. Ploughing 3 inches deep should not in any way injure the trees. A greater depth could be made throughout the centres of the rows of trees. Pear trees would no doubt throw out a few suckers if the trees were badly damaged. The apple and stone fruits would, in my opinion, not throw out suckers.—W. J ALLEN.

BLOOD SCOURS IN CALVES.—"A.P." has lost three picked heifers from this disease. They were fed on dry lucerne hay during the drought.

This disease is of a very fatal nature, sometimes causing death in twenty-four hours, and if the calf lives for several days the chance of recovery is, even then, slight. Commence treatment early by applying mustard, mixed into a thin paste with vinegar, to the outside of the abdomen, rubbing in well for some moments. The subcutaneous injection of ergotine in 5-grain doses is the best treatment, but half-drachm doses of powdered opium, mixed with flour gruel, every four hours, are also useful. Milk, with a dessertspoonful of whisky to the quart, should be given as food. If these remedies do not cause early improvement, the calf is not likely to recover.—VETERINARY OFFICERS.

COW'S DISEASED UDDER.—"Kenmure": This is undoubtedly a case of contagious mammitis, and, as the disease has become chronic, curative treatment is out of the question. Abscesses frequently form in such cases, and the best result that can now happen will be for the quarter to become dry. As the disease is very contagious, the cow should be isolated from other cows and milked separately. Milk from the diseased quarter should be either burned or mixed with strong disinfectant. After milking this cow, the hands should be washed before milking others.—VETERINARY OFFICERS.

EROSION OF RIVER BANK.—"I.C.D.": The Public Works Department's officers find it impossible to make a definite recommendation as to the best means of protecting your frontage, but from the general description of the site, probably the most effective remedy would be the sloping back of the vertical alluvial bank, and planting or sodding with grass on a slope of 1½ to 1.

CONCRETE DAM.—"J.McF.": A dam to hold 10,000 gallons would require to be 9 feet deep, if it were 18 feet long by 10 feet wide; 66 bags of cement would be required for construction of a dam 18 feet by 10 feet, by 9 feet deep, rendered ⅜ inch thick, the concrete having three bags per cubic yard Thickness of walls should be 9 inches, if not more than 2 feet above the ground. Sandstone broken to 1½-inch gauge will be suitable for concrete.—A. BROOKS.

BONE-MEAL FOR BONE-CHEWING CATTLE - "J.E.Z": Sterilised bone-meal for feeding purposes can be obtained from manure merchants at about 5s. 3d. per cwt., but any bone-meal which has been subjected to heat will serve the purpose.—VETERINARY OFFICERS.

TAPE-WORM IN DRAUGHT HORSE —"C.C.": Feed in small quantities during treatment. Give at least one dry feed during the day, and mix in it 15 grains of Thymol. Do this for five days, and then give 1½ pints of raw linseed oil, with 4 tablespoonfuls of turpentine shaken up in it. Allow plenty of salt in the feed.—VETERINARY OFFICERS.

GREASY HEELS IN STALLION.—"C.G.": The case is apparently true grease. The horse should be rested, as movement usually results in fissures forming in the skin. The parts should be washed with warm water and soap, rinsed in lysol water, one dessertspoonful to the quart, and carefully dried. Then an ointment, composed of biniodide of mercury (1 part) and vaseline (5 parts) should be smeared on some wadding and applied to the fetlock. This wadding must be kept in position by a calico bandage, which should not be too tightly applied. The dressing may be left on till it gets wet through, when it should be removed and the parts again washed, dried, and re-dressed in the same way. This treatment should put the leg right in about a fortnight. During treatment, be careful not to over-feed, and an occasional bran mash, with a tablespoonful of nitre, should be given.—VETERINARY OFFICERS

Later, the correspondent stated that under this treatment the horse was improving very satisfactorily, but the swelling was going down very slowly. He was informed that the ointment is to reduce the part as well as heal it No water need be used, but the parts may be cleaned with a little wadding before applying more ointment. A little exercise can be given if there are no fissures in the legs.

Department of Agriculture,
Sydney, 2nd September, 1912.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORN.—Duke of Hampton: sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

GUERNSEYS.—King John: sire, King of the Roses (imp.); dam, Saucy Rose; calved 29th August, 1911; colour, lemon and white. Price, **£50.**

Saucy Rose is by Calm Prince from Rose Petal; she yielded 5,298 lb. milk with an average test of 5 per cent. butter-fat, or a butter production of 311 lb.

Belfast: sire, King of the Roses (imp.); dam, Flaxy 2nd; calved 20th September, 1911; colour, lemon and white. Price, **£40.**

Flaxy 2nd is by Rose Prince (imp.) from Flaxy (imp.). Flaxy (imp.) in thirty-seven weeks gave 6,443 lb. of milk, which it is estimated produced 334 lb. of butter. Flaxy 2nd developed a habit of sucking herself, and the only record shows 3,333 lb. of milk, testing 5 per cent.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Beaucaire's Baby: sire, Monsieur Beaucaire; dam, Rosey of Wollongbar; calved 28th March, 1911. Price, **£40.**

Confidence: sire, Royal Preel, by Itchen Preel from Hayes' Lily du Preel (imp.); dam, Faith, by Prince Souvia from Clatford Hopeful (imp.); calved 30th April, 1911. Price, **£45.**

HOLSTEIN HEIFERS FOR SALE,

WOLLONGBAR EXPERIMENT FARM.

Name.	No.	Sire.	Dam.	Calved.	Price.
					£
Folkeen	135	Hollander... ...	Folkje (imp.)	18 May, 1908 ...	25
Douwe Margy	225	President Douwe .	Marjaric	18 Nov., 1909 .	25
Douwe's Lolkje ...	213	,, ,,	Lolkje Field ...	4 Jan., 1910 .	25
Obedience	247	Obbe 2nd	Lady Hague ...	9 Aug., 1910 ...	20
Magdeburg	304	De Wet	Lolkje Amster ...	25 Aug., 1911 ..	15
Hamburg	305	,, ...	,, ,, ...	25 Aug., 1911 ..	15
Madelein	308	,, ...	Marjaric	9 Aug., 1911 ...	15

H. C. L. ANDERSON, Under Secretary.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull	Sire.	Dam	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	....	....	Berry	*
Shorthorn	Pansy's Progress	Dora's Boy	Pansy 4th (im.)	Wollongbar Farm	*
,,	Imperialist	Florio	Lady Nancy of Minembah.	,, ,,	*
,,	March Pansy	Earl March	Australian Pansy	Grafton Farm	*
,,	Royal Pansy	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm	*
,,	Thessalian II.	**Thessalian** (imp.).	Egyptian Princess (imp).	,, ,,	*
,,	Bridegroom	Best Man	Golden Omelette	Yanco Farm	*
,,	Jamaica Jack	Sir Jack	Rum Omelette (imp.).	Wollongbar Farm	*
,,	Royal Blood	Berry Melbourne	Calceolus	,, ,,	*
,,	Xmas Fox (imp.)	Silver Fox	Malvoisie	Berry Farm	*
,,	Kaid of Khartoum	Sir Jack	Egyptian Belle	Cowra Farm	*
Guernsey	The King's Mirror	Calm Prince	Vivid (imp.)	Swan Bay	22 Dec., '12.
,,	Star Prince	Calm Prince	Vivid (imp.)	Kyogle	1 Feb., '13.
,,	Sky Pilot	Prince Souvia	Parson's Red Rose (imp.)	Maclean	15 Jan., '13.
,,	Prince Souvia	Vivid's Prince	Souvenir (imp.)	Grafton	1 April, '13.
,,	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras	H.A. College, Richmond	*
,,	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '12.
,,	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,,	Claudius	Golden Star II.	Claudia's Pride (imp.).	Tweed River	12 Feb., '13.
,,	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes	Berry Farm	*
,,	Good-bye	Western Duke	Souvenir (imp.)	Rous Mill	1 Nov., '12.
,,	The Peacemaker	Calm Prince	Rose Petersen	Jones' Island	1 Dec., '12.
,,	King of the Roses	Hayes' King	Rosey 8th (im.)	Rookwood Asylum	23 Oct.; '12.
,,	Lauderlad	Laura's Boy	Souvenir of Wollongbar	Lismore	3 Jan., '13.
,,	Royal Preel	Itchen Royal	Hayes' Lily du Preel (imp.).	Murwillumbah	10 Nov., '12.
Ayrshire	Jamie's Heir	Jamie of Oakbank	Miss Prim	Wollongbar Farm.	*
,,	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose	Grafton Farm	*
,,	Orphan Boy	Songster of Greystanes.	Rosamond	Glen Innes Farm	*
,,	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry	Kildare II	Kildare (imp.)	Belvedere Bratha 3rd (imp.).	,, ,,	*
,,	Bratha's Boy	Aiome Chin (imp.)	Bratha 4th	,, ,,	*
,,	Rising Sun	Bratha's Boy	Dawn	Bathurst Farm	*

* Available for service only at the Farm where stationed † Available for lease, or for service at the Farm

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

Society.	Secretary.	Date.
1912.		
Ariah Park P., A., H., and I. Association	J. N. Taylor	Sept. 3, 4
Manildra P. and A. Association	C. M. Podmore	,, 4
Grenfell P., A., H., and I. Association	Geo. Cousins	,, 4, 5
Germanton P., A., and H. Society	J. S. Stewart	,, 4, 5
Albury and Border P., A., and H. Society	W. I. Johnson	,, 10, 11, 12
Young P. and A. Association	T H. Tester	,, 10, 11, 12
Moama A. and P. Association	A. E. Bartlett	,, 11
Cootamundra A., P., H., and I. Association	T. Williams	,, 17, 18
Cowra P., A., and H. Association	W. T. Fisher	,, 17, 18
Canowindra P., A., and H. Association	G. Newman	,, 24, 25
Ganmain A. and P. Association	J. F. Ashwood	,, 24, 25
Henty P. and A. Society	H. L. Yates	,, 24, 25
Murrumburrah P., A., and I. Association	J. A. Foley	,, 24, 25
Temora P. and A Association	W. H. Byrnes	,, 24, 25, 26
Wellington A., P., and H. Association	A. E. Rotton	,, 25, 26
Burrowa P. A. and H. Society	W. Burns	,, 26, 27
Millthorpe P. and A. Association	R. H. French	Oct. 1, 2
Carcoar H., C., and A. Association	F. J. Brady	,, 16
Hillston P. and A. Association	S. J. Gordon	,, 16
Adelong P. and A. Association	A. W. Molineaux	,, 22, 23
Lismore A. and I. Society	T M. Hewitt	Nov. 6, 7, 8
Tweed River A. Society	A. E. Budd	,, 13, 14
Mullumbimby A. Society	W. O. Davis	,, 27, 28
1913.		
Albion Park A., H., and I. Association	M. A. Brown	Jan. 15, 16
Kiama A. Association	G. A. Somerville	,, 25, 27
Wollongong A., H., and I. Association	M. A. O'Donnell	,, 30, 31, Feb 1.
Berry A Association	C. W. Osborne	Feb. 5, 6
Alstonville A. Society	W. M. Monaghan	,, 11, 12
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 12, 13
Guyra P., A., and H. Association	P. N. Stevenson	,, 18, 19, 20
Cobargo A., P., and H. Society	T. Kennelly	,, 19, 20
Wyong A. Association	J. H. Kay	,, 20, 21, 22
Central Cumberland A. and H. Association	H. A. Best	,, 21, 22
Dapto A. and H. Society	J. H. Lindsay	,, 25, 26
Campbelltown A. Society	F. Sheather	,, 26, 27
Gunning P., A., and I Society	J. R. Turner	,, 26, 27
Tumut A. and P. Association	T. E. Wilkinson	,, 26, 27
Armidale and New England P., A., and H. Assoctn.	A. McArthur	,, 26-28
Northern A. Association (Singleton)	E. J. Dann	,, 27, 28, Mar. 1.
Southern New England P. and A. Association, Uralla.	W. McCrossin	Mar. 4, 5
Mudgee A., P., H., and I. Association	P. J Griffin	,, 4, 5, 6
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 4, 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Camden A., H., and I. Society	A. Thompson	,, 5, 6, 7
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge	,, 11, 12, 13
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12, 13
Macleay A., H., and I. Association	E. Weeks	,, 12, 13, 14
Upper Hunter P and A. Association, Muswellbrook	R. C. Sawkins	,, 12, 13, 14

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VOL. XXIII. PART 10. OCTOBER 2, 1912.

Agricultural Gazette of New South Wales.

The Feeding of Farm Horses.

THE Principal of the Hawkesbury Agricultural College and Managers of Experiment Farms throughout the State were recently asked to describe the methods of feeding farm horses in use at each institution, and to give any information from the experience of the Farm which would be of value to farmers, particularly in dry seasons. The reports are published below.

A few general remarks upon feeding farm horses and the intrinsic value of the feeds mentioned are first given. They are mostly condensed from "Feeds and Feeding," the standard work on the subject of feeding farm animals, by Professor W. A. Henry, of Wisconsin University.

Feeding the Work Horse.

As an introduction, the following remarks are quoted verbatim from Professor Henry's book :—

> The work horse, having but few days of idleness, possesses a hearty appetite and a vigorous digestion, so that if intelligently cared for, his lot is not altogether an unhappy one ; nor is he to be commiserated when compared with his aristocratic kin, the carriage horse, which by high living and periods of enforced idleness, followed occasionally, perhaps, by hours of over-exertion, generally has but a brief career, and that sometimes attended by many ills. Regularity in work brings regularity of feeding, and these greatly conduce to comfort and long years of usefulness.
>
> The work horse should be supplied with about 2 lb. of provender daily for each hundred pounds of weight. Of this, from 10 lb. to 18 lb., according to the severity of the labour performed, should be grain in some form. The heavy feeding should come at night, after the long day's work is over, and when the animal has time for masticating and digesting his food. After watering comes the administration of the grain, which should constitute one-half to two-thirds of the day's allowance. This may be fed separately, or preferably upon moistened, chaffed hay. The amount of chaffed hay with which the grain is mixed should not exceed 1 peck in volume. Ground grain and chaffed hay are fed in mixed form, that the animal may masticate his food and pass it to the stomach more quickly than is possible with the material whole and in dry form. A fair allowance of long hay should always be thrown into the manger for the animal to finish on, after the stomach is replenished, and while he is resting but still requiring more food.
>
> The morning meal should be comparatively light, consisting mostly of grain with some chaffed hay. It should not possess much bulk, and should be in condition to be easily and rapidly consumed, so as to be well out of the way when the animal is led from the stable.
>
> The midday meal is omitted in many stables ; but most horsemen hold that some grain should be given at noon, which claim seems reasonable from our knowledge of the horse's stomach and the digestive process. In any case the amount of feed given at midday should not be large.
>
> Idle horses may be maintained wholly, or almost wholly, upon hay, straw, or corn fodder, fed uncut. Such animals have ample time for masticating food, and their systems not being taxed by labour, they are able to subsist on food which contain a large percentage of inert matter. Forage possessing considerable volume, as hay and straw, is suitable for such animals, because a reasonable amount will furnish the necessary nutriment, and it is better to have the digestive tract well distended with food substances than contracted, as would the case if concentrates possessing only the requisite nutriment were supplied.

> For horses taxed to the limit of their endurance, all grain should be ground and fed upon moistened, chaffed hay. Food thus prepared is more rapidy masticated, and consequently remains a longer time in the stomach. A little long hay may be supplied the animal, to be consumed at leisure after the stomach is well filled. Understanding the requirements of animals representing the two extremes, one can adjust the food preparation and supply to meet the various intermediate cases as they arise.

Of course the Professor is speaking of horses maintained wholly upon manger feed. Every Australian knows that an idle horse can keep himself upon grass. Indeed, the frequency of country racing competitions for grass-fed horses would, perhaps, surprise horsemen from other countries who are unacquainted with the feeding value of our native pastures.

Some Practical Points.

A few further remarks upon several aspects of feeding horses, condensed from Professor Henry's work, may not be out of place here, and may be found useful by farmers who do not possess a copy of the book.

Order of Feeding and Watering.—After reviewing the conclusions of various investigators, Professor Henry recommends that horses should receive their regular and largest supply of water previous to feeding, and it may be well to supply a limited quantity after feeding. Horses heated and fatigued may be given 8 or 10 quarts of water, even if cold, the balance of requirements being supplied after they are rested and cooled. On the road a few quarts may be given, no matter how much the horse is heated, but never give a large quantity at one time. On journeys, give water every few miles. Water the horse often, so that he will drink only a small quantity at a time.

Water first, then feed ground grain sprinkled upon a small allowance of moistened chaffed hay. Do not over-feed with hay, or many ills will result—staring coat, laboured breathing, and quick-tiring being the least serious. Give each horse a definite allowance of hay, and never as much as he will consume. Feed regularly and uniformly.

The Importance of Variety.—Plenty of oats and good hay will supply energy and spirited action, but a horse is better nourished by several kinds of grain and forage plants than by one or two only. A case is quoted of some collieries in the North of England, employing 7,000 horses, which failed to perform satisfactory work and maintain their condition when fed continuously on oats and hay. When, however, the feed was changed to a mixture of crushed peas, crushed barley, crushed oats, bran, and hay, the horses did a great deal more work, and in three months were in excellent health and condition; and it was found that the change saved £3,662 per annum.

Midday Feeding.—Though in some establishments, horses go from daylight to dark without food, Professor Henry recommends that a small feed of grain be given at midday.

Grinding Grain.—"For horses which are out of the stable during the day and worked hard, all grain, with the possible exception of oats, should be ground. For those at extremely hard work, all grain should be ground and mixed with chaffed hay. For idle horses, oats or corn should not be ground, nor need the hay or straw be chaffed." Of course, much depends upon the state of the horses' teeth, but, generally speaking, idle animals have more time for mastication and digestion than those in continuous work.

A Skilled Art.—"The indescribable qualities which, rightly commingled, mark the good feeder, cannot be acquired from lectures nor from books, but must, in a large measure, be born in the horseman. Study and observation will add to the ability of the feeder, but all that may be written will not make an adept, nor cover his defects, if he does not take to the work naturally."

Some Standard Feeding Stuffs.

In reading the reports which follow, it will be noticed that a considerable number of different feeds are used on the Experiment Farms. A few brief notes from Henry's work will show the intrinsic merits of some of those more commonly used :—

Oats.—"Horses nurtured on oats show mettle which cannot be reached by the use of any other feeding stuff." Chemists have failed, however, to find the stimuating principle in oats. They should be fed whole, unless the horse is pressed for time or has poor teeth. Professor Henry recommends that *some* oats be included in every ration, on account of their palatability. New oats are generally regarded as unfit for horse-feed, it being alleged that they soften the horses, causing them to sweat easily.

Maize.—"Next to oats, corn is the commonest grain for horses in America." In this State almost the whole maize crop harvested is fed to horses. Professor Henry regards it as not the equal of oats, but recent American experiments have shown that maize fed with lucerne gives practically as good results as oats and hay. This is rather fortunate, because maize and lucerne can usually be grown in the same localities. Maize should generally be ground for working horses, and "corn and cob meal is preferable to pure corn meal." Maize is best suited for animals at plain, steady work. Wolff, as the result of German feeding experiments, regards 5 lb. maize as equal to 4 lb. oats.

Barley,—This grain lies between oats and maize in protein and carbohydrates, and has less oil than either. On the Pacific coast of the United States it is extensively used for horse-feed, because maize and oats do not flourish as well there. When the horse's teeth are good and the labour not severe, it may be fed whole. If ground it forms a pasty mass in the mouth; it is better to crush the grains between iron rollers.

Dried brewers' grains were found to be equal to oats in New Jersey, but the German War Department found their effect to be uncertain, and abandoned their use.

Wheat and By-products.—"Wheat has probably never been degraded to stock-feeding purposes until the most recent times." Mixed with maize, oats or bran, it is superior to either alone for work horses. Horses fed wheat alone will go "off feed" and suffer other digestive derangements, and "the less expert the feeder the greater the risk." Whole wheat has no advantage over the same weight of bran and shorts in the ration, but two parts ground wheat and one part bran make a good ration fed with hay. The "bran mash," made by scalding bran with hot water, is fed once or twice a week as a laxative in most countries. Lucerne is found to have a similar effect.

The "Roughage."—The growth of wheat and oats for hay does not appear to be as common in the United States as in Australia; consequently Professor Henry has very little comparative data to offer. Barley is the common hay crop of the Pacific States, except where lucerne is grown; in the rest of the Republic, timothy and other grass-hay form the principal "roughages." The reader is referred to the article, "Some Hints on the Preparation and Marketing of Chaff," by A. H. E. McDonald, in the *Gazette* for January, 1910, as well as to the remarks of the Farm officers below.

Straw forms a feeding stuff much inferior to hay, but is generally regarded as well worthy of conservation against times of drought, when the more valuable feeds are scarce and dear. Mixed with molasses, straw chaff forms an excellent horse-feed, and during the recent drought many farmers were enabled to keep their working horses in good condition in this way.

Lucerne, both as pasturage and as hay and chaff, is extensively used in those parts of the State where it is grown. For a long time its use for horse-feed was discountenanced by many writers, but American experiments have now proved its value when fed with maize to horses (*vide Gazette*, May, 1912, page 382).

Clover hay has much the same value as lucerne hay—both are highly nitrogenous feeds, and are to be preferred as "roughage" when the grain used is rich in carbohydrates but weak in protein, such as maize.

"Sorghum produces a coarse hay of high feeding value. The leaves of all varieties of sorghum form a bright, palatable, nutritious hay, free from dust, and very useful for feeding horses especially." It would be very hard to find any portion of the agricultural areas of New South Wales where sorghum cannot be grown in almost any season, and its use for horse-feed seems destined to become far more extensive.

"Silage is pre-eminently a food for the cow, and its use will largely remain with the dairy-farmer. . . . . Some silage may be fed to idle horses, but for working horses the amount must necessarily be limited, because of its bulky, soft character." In times of drought, silage—often the only feed readily and cheaply obtainable—may be used to form portion of the ration, but we cannot make it the mainstay of our horses as we can with cattle and sheep.

Principal Feeds used at Experiment Farms.

The following is a summary of the Farms at which the feeds mentioned are extensively used. It may serve as a rough indication of the portions of the State where each staple is sufficiently cheap, or so much more reasonably obtainable than other feeds, to form an essential part of the feeding of farm horses.

GRAINS.

Oats.—Hawkesbury Agricultural College, Bathurst, Glen Innes, Berry, Cowra, Yanco, Dural, Coonamble.

Maize.—Hawkesbury Agricultural College, Grafton, Wollongbar, Dural, Berry, Hunter Valley, Bathurst, Glen Innes, Nyngan, Coonamble.

Barley.—Wagga, Bathurst, Dural.

Wheat.—Wagga, Bathurst, Cowra.

Bran.—Hawkesbury Agricultural College, Dural, Berry, Hunter Valley, Glen Innes, Cowra, Nyngan, Coonamble.

ROUGHAGES.

Wheaten Chaff.—All farms.

Oaten Chaff.—Hawkesbury Agricultural College, Grafton, Wollongbar, Bathurst, Glen Innes, Cowra, Yanco.

Lucerne Hay and Chaff.—Hawkesbury Agricultural College, Hunter Valley, Grafton, Wollongbar, Bathurst, Glen Innes, Yanco.

Clover Hay.—Glen Innes.

Sorghum.—Hawkesbury Agricultural College, Grafton, Dural, Berry, Wollongbar, Yanco.

The reports are now given in full, the farms being grouped into Coastal, Tableland, Western Slopes, Riverina, and Western Plains.

COASTAL DISTRICTS.

1. Hawkesbury Agricultural College.

GEO. COBB, Farm Foreman.

OUR horses are fed three times a day in the stable at the following hours:—5 to 7 a.m., 12 noon to 1 p.m., and 5 to 8 p.m. For a heavy draught in active work the average daily ration consists of about 18 lb. of chaff, 9 lb. of crushed maize, and 3 lb. of bran. When lucerne is available, 4 or 5 lb. is chaffed with the wheaten or oaten hay, and the bran dispensed with.

During the winter months a few bags of chaff are put in the troughs in the paddocks, an average of 10 lb. per horse per night, to supplement the stall feeding. This serves the dual purpose of keeping the animals in better heart and condition, and of minimising the risk of flatulent colic which sometimes occurs by eating too greedily when coming in very hungry on cold mornings.

No maize is given on Saturday evenings, nor at any time on Sundays.

Rock salt is available at all times in the mangers.

After work, at 5 p.m., the horses are rugged, to avoid the risk of chills by standing in the stables till 8 p.m.

During spring and summer, when grass is plentiful the outside feeding at night is stopped. The stable ration is also modified, according to the condition and appetite of each animal.

When the horse is taken off active work the corn is stopped, and only enough chaff is given to supplement the grazing, in order to keep the horse in good condition. This chaff is supplied in open sheds with earthen floors to lessen the strain on the legs, which necessarily arises with hard floors. The horses appear to enjoy their feed better outside, having access to it at their will, and they also inhale much less dust.

When maize is dear and oats more reasonable, they are used in equal proportions *crushed.* In an abnormal season, when the hay crop has proved light, Hungarian millet and Early Amber Cane sorghum have been sown in spring, after all danger of frosts is over, made into hay, and used in the proportion of one-third of either of these to two-thirds of wheaten or oaten hay. The millet must be cut on the young side, otherwise it becomes very harsh, and there is considerable difficulty in curing the sorghum.

To provide sufficient horse-feed, it is necessary to sow at least as large an area as will yield this quantity in average seasons. We always endeavour to have at least three months supply of the previous crop on hand, thus allowing the new hay to sweat and cool down before use, as it invariably scours horses when fed too new.

We have found it very desirable to crush all grain fed to horses, as it renders it far more digestible. For light horses, used for coach and other fast travelling, it has been found preferable to use oaten chaff (a year old, if possible) and crushed oats. This avoids the scouring and undue sweating that wheaten hay and maize create in rapid work.

In the wheat areas in South Australia, I have frequently fed farm horses on inferior wheat, boiled and mixed with the "blow" chaff from the winnower, with no bad results. I have worked horses all the seeding season on this feed.

2. Demonstration Orchard, Dural.

E. ARCHER, Foreman.

THE usual quantities of feed for the horses in work at the orchard are :—Chaff, 20 to 25 lb.; maize, 6 to 8 lb.; bran, 3 to 4 lb. per horse per day. The times fed are 6 a.m., 12 noon, and 5·30 p.m. When green feed is available, the horses have 20 to 30 lb. each at the 5·30 p.m. feed, with less chaff and no bran. The green feed is cut up with the chaffcutter.

The only variation in the ration for horses in full work is in the green fodder—barley, oats, maize, and sorghum being fed according to seasons.

When the horses are not in active work no maize is given. The other ration is as usual.

Chaff, maize, and bran are purchased for the orchard, and only green feed is grown. The space available for growing horse-feed is limited.

If space permitted, sorghum would be grown, and during the winter months it could be chaffed and bran mixed with it. This is good feed, and horses work well on it. Most local farmers grow sufficient to allow of this being done, and use nothing else while it lasts them. Given a fair season, sorghum crops are heavy almost anywhere in this district.

3. Berry Experiment Farm.

P. McLEOD.

In preparing horses for the heavy work on the Farm, which with us consists chiefly in the preparation of the soil in the autumn and early spring, those that have been running idle on pasture, are given in addition one feed daily of 3 lb. maize and 3 lb. chaff for a week prior to commencing work. This practice, we find, hardens and strengthens the animals, and brings them on to their food gradually; and they do not "cut up" and lose flesh, as they otherwise would if put to work off grass alone. They are also worked steadily for a few days at the start, to allow them to become accustomed to the strain.

The rations supplied, while on active work, subject to slight modifications, according to the size of the animals and the severity of the labour performed, are as follow:—6 a.m., 3 lb. maize, 3 lb. chaff; 12 noon, 3 lb. maize, 3 lb. chaff; 6 p.m., 3 lb. maize, 3 lb. oats, 4 lb. chaff, ½ lb. bran.

For roughage at night, when grass is not plentiful, we give any suitable food that happens to be available, such as oaten, wheaten, or Planter's Friend hay; or for greenstuff, barley, wheat, oats, or Planter's Friend, as much as they will clean up readily. If there is plenty of grass in the paddocks we do not supply any roughage at night, but on no account do we cut down the concentrates in the heavy ploughing seasons. Our horses are never let go down, and therefore need no building up.

All grain is crushed, and the dry feed sprinkled with just sufficient water to lay the dust. We find the horse relishes the food better in this way than if fed uncracked and dry, and it is eaten up more readily.

A block of rock-salt is provided for the animals to partake of at will. The feed-boxes are kept clean, and free from any stale food that is apt to collect therein.

The stipulated feeding hour is adhered to as closely as possible, so as to avoid the evil practice of long fasting; but if from some unavoidable cause the animal does happen to miss his regular meal hours, his allowance is not increased on his return to the stables, or, in other words, he is not allowed to gorge himself.

The horses are rugged in the autumn and winter months, and those wearing heavy coats are clipped, and provided with an extra blanket made by sewing an old rug, that is perhaps useless in itself, on to the inside of a new one. This makes an excellent cover.

Under ordinary conditions the horses are allowed water at all times, both before and after feeding, and as often as convenient during the working hours; but care is taken not to let heated animals drink too much.

Horses not in Active Work.

To those animals doing casual labour of a more or less light nature, we give some of the more bulky foods, such as chaffed Planter's Friend mixed with equal quantities of oaten or other chaff, and a little bran; or perhaps green oats, barley, or wheat. If these are not available we supply a grain ration of

3 lb. maize and 3 lb. chaff, once or twice daily, varying according to the condition of the pasture and what is considered essential for the upkeep of the condition of the animal. When the horses are at rest, our pastures are as a rule quite sufficient to maintain them in good condition, and very often they make weight rapidly.

FODDERS FOR HORSES ON THE SOUTH COAST.

We have never experienced a drought severe enough to render it impossible to grow feed sufficient to keep the farm horses in from fair to good condition. Even in dry seasons, with thorough cultivation, the crops sown in drills, such as maize for grain or for green feed; maize and cowpeas, and Planter's Friend and vetches, grow more or less successfully on the South Coast. With these and other crops sown broadcast for hay or greenstuff—mainly oats, Planter's Friend, maize, and a little barley and wheat—there is ample for the horse, provided he is not robbed for the sake of the cow.

In extreme cases we have adopted the following ration for a short period, when the horses were on light work :—1 lb. maize, 1 lb. soaked oilcake, equal quantities of silage and oaten chaff (as much as they will clean up readily), ½ lb. bran, and a little molasses.

In making provision for horse-feed, we select the best land for growing the maize crop for grain, and also for growing barley for green feed. For crops such as sorghum, wheat, oats, &c., we find a medium class of soil more suitable, as when grown for the horse it is desirable that the crop be of fine quality, whether intended for hay or for green feed. These fodders are sometimes sown in combination with cowpeas and vetches, according to how they are intended to be used.

CARE OF THE DRAUGHT HORSE.

The heavy horses are too often a secondary consideration, and I attribute any existing bad conditions in this class of animal on the South Coast, more to neglect and ill-treatment than to scarcity of food, or the inability to grow it. Our experience on the Farm has taught us that it is better to feed the hard-worked horses well. It pays handsomely in the end—they do a lot more work, and it is a pleasure to drive them. With underfed animals, the labour is performed under difficulties, which causes many drivers to throw the blame on to the unfortunate beasts, and knock them about in consequence, often making confirmed "jibs" of them; and so they drift from bad to worse until finally they become miserably poor and useless. It too often happens that the light pleasure horse is well cared for, while the more valuable, hard-worked draught, the principal working animal on the farm, is neglected.

4. Hunter River Valley Viticultural Station.

DAVID JENKINS, Nurseryman-in-Charge.

EACH horse received two feeds a day, consisting of 8 lb. of chaff, 1 pint of maize, ½ pint of bran. This is thoroughly mixed together and moistened with water, and a little green lucerne is added every day when procurable. As there are no pastures here, horses are stable-fed all the year round, and the rations do not vary.

When the horses are taken off active work they receive only one feed a day, with, in summer time, a little green lucerne, and are turned out in the bush.

The rations adopted during abnormal seasons are the same as above, including a packet of Epsom salts periodically, thoroughly mixed with the food, to keep the blood cool, in lieu of green lucerne.

I have sown about ¾ of an acre of Algerian oats, also Cape barley, to be used as green fodder, and intend to plant maize to be used as a break-wind for vines in the nursery, and for horse-feed.

At this station we have great trouble with the hoofs of horses, which become sand-cracked, necessitating their visiting the blacksmith regularly. When in active work they are regularly groomed, to prevent sore shoulders, as it is very hard indeed on horses pulling through this heavy sand.

5. Grafton Experiment Farm.

A. H. HAYWOOD, Manager.

WORKING horses are fed at 6 a.m., 11·30 a.m., and 5 p.m. The quantity of feed allowed for a draught horse daily is 15 lb. maize, 20 lb. chaff. The second item consists of wheaten or oaten chaff and chaffed lucerne, mixed in equal proportions. All horses are turned out at nights in grass paddocks.

In abnormal seasons the same daily ration is available, and is used.

When pastures are very dry, the feed is supplemented by green fodders (in season), such as sorghum, maize, barley, and lucerne.

When horses are taken off active work they are turned out to pasture.

Wheat and oats are planted in April and May, and sometimes later, to provide hay and chaff all the year round.

Wheat for hay and chaff may be successfully grown here, providing suitable varieties are selected (Thew, Warren, and others recommended by the Department). Algerian oats can also be grown successfully on the coast. Barley and lucerne, fed green, are good laxatives to use.

Lucerne hay is excellent food for young growing horses.

6. Wollongbar Experiment Farm.

J. G. McMILLAN, Manager.

THE method of feeding farm horses at Wollongbar has been simply to give a mixture of wheaten and oaten hay, with about 2 lb. of crushed maize at each feed. At the present time we are feeding the following mixture:—2 lb. crushed maize; 1 lb. bran; 1 lb. crushed linseed cake; with wheaten and oaten chaff *ad lib.* To this is also added about 4 lb. of lucerne for each horse, and a small quantity (about 3 lb. per horse) of chaffed green Planter's Friend sorghum.

This is given in two feeds. When the pastures are dry, the above mixture is damped with water containing molasses. When horses are not in active work, they have only the ordinary pastures. The past season is one that may be termed abnormal for this district.

Provision is made for feed with ordinary winter fodder crops, when sufficient quantities of oats, wheat, and maize are grown. An area of 3 acres of lucerne has been sown, so as to supply hay to give us nitrogenous matter.

In the event of dry seasons in this district, I would suggest that all farmers have a small area of lucerne; also grow sufficient oats and wheat during winter months, and have on hand a small quantity of crushed linseed cake.

TABLELAND DISTRICTS.

1. Bathurst Experiment Farm.

R. W. PEACOCK, Manager.

THE feeding of farm horses varies considerably upon different farms, and is in no small measure regulated by the potentialities or limitations in the growth of the various suitable fodders. Most farmers have a decided objection to purchase food-stuffs, and rely mainly upon the resources of their own farms, notwithstanding that the policy of purchasing some section of the ration would unquestionably prove more economical. This feeling has in no small measure its effect upon the feeding at this Farm. Fortunately the products grown here are sufficiently varied to give very satisfactory results. Those which enter largely into the ration are wheaten, oaten, and lucerne hay, and wheaten and oaten straw, for the roughage; and maize, oats, wheat, and barley for the concentrates. The quantities of these used vary considerably, owing to seasonal variations leading to a plethora or otherwise of any particular product. Those most depended upon and sought after are wheaten, oaten, and lucerne hay, and maize and oats.

Owing to the concentrated nature of the farming here, the horses are almost wholly hand-fed, and pastures, which are extremely limited, are rarely availed of for the horses.

During the past twelve months 19 horses consumed, in round figures, 31 tons wheaten, 17 tons lucerne, 2 tons oaten hay, 11 tons wheaten and oaten straw, 495 bushels maize, 25 bushels oats, 135 bushels wheat, 30 bushels mixed barley and rye. In addition to this, an equivalent of 2,718 lb. hay and 733 lb. grain was given in the form of grazing upon lucerne. During summer nights the horses had the run of some heavily stocked bush land, the feeding from which would be almost negligible. The actual quantities of fodder per horse per day were 20¾ lb. chaff and 5·6 lb. of grain. These horses during three months of their hardest work consumed per day 28·3 lb. of chaff and 7·25 lb. of grain. The quantity of grain would have been increased and the chaff reduced, but for a partial failure of the maize crop, which called for caution with the grain supply.

The ration generally fed for the horses doing heavy work is 24 lb. chaff and 10 lb. of grain per day. When doing lighter work the grain is reduced to 6 lb. per day. When the horses are not working the chaff also is reduced, and the lower quality chaff fed. The average weight of the horses fed is approximately 1,400 lb. The amount fed to horses on heavy work would thus be approximately 25·4 lb. per day for every 1,000 lb. live weight. The average throughout last year was 18·8 lb. per 1,000 lb. live weight.

It would be advantageous to increase the proportion of grain, such as oats, in order to narrow the nutritive ratio. This is done in some measure by the admixture of lucerne in the feeding stuffs mentioned. Upon the fodders described the horses have done heavy work and retained excellent condition.

The horses are fed three times a day. The hay is always chaffed and the grain crushed. The midday meal is more concentrated, containing more grain and less chaff than the evening meal. At night they get the greatest bulk, when they have ample time to masticate and digest it. In the morning a feed slightly larger than at midday is given. The horses have access to water both before and after feeding. Watering before meals is encouraged. A supply of rock-salt is kept in a division of each manger. In the winter they are bedded down in a comfortable stable. They are changed from one class of fodder to another gradually, as violent change is harmful. At the end of the week, when practicable, the horses are turned into a lucerne paddock, but never when tired and hungry; the usual midday meal is fed before turning the horses into the paddock.

Digestive troubles rarely occur. When a horse appears to be off his feed, a couple of drenches of raw linseed oil are given, and this treatment invariably has the desired effect. Green lucerne is used as a laxative, and when this is not available, from 2 to 3 ounces of Epsom salts are given twice a week.

When wheat is fed, it is mixed with other grains, such as oats or maize, and it is always crushed. No ill effects from feeding it have been experienced. Chick wheat and screenings from the grader are what are used to augment the grain supply.

The amount of fodder required for the horses is based upon the previous year's consumption, and a suitable margin is allowed. To provide wheaten hay, an area is grown solely for the purpose, and this is supplemented by the cutting of divisions and headlands, which act as firebreaks and prevent the knocking down of ripe grain by the machines. Algerian oats are grown both for hay and grain. Maize is grown mainly for grain supply. Lucerne takes a prominent place at this Farm, and is a valuable aid. Wheats are always cut for hay before any grain is formed, so that when fed as chaff, grains which might evade digestion will not foul the land.

In the combating of diseases, such as flag smut and take-all, the spores of which are carried over in fodders and horsedung, only oaten hay or oaten straw mixed with lucerne, and maize or oats grain, are fed when working the fallows or sowing the wheat areas, as such fodders are not carriers of those diseases.

Lucerne is valuable, on account of its narrow nutritive ratio, for mixing with straw, which has a wide ratio. This chaff, with suitable grain, is valuable for horses doing light work or resting, to supplement the higher class fodders. As an admixture with wheaten or oaten hay, lucerne is extremely valuable, and allows of a reduction in the quantity of grain. To obtain the best work from old horses, a little bran is given, and is a valuable adjunct in limited quantities to any ration. The quality of the hay used at this Farm is, generally speaking, very high. The district is renowned for the quality of such products. This high quality unquestionably adds to their palatability and nutritive properties.

In dry seasons, or periods of scarcity, fodder supplies are short and therefore of high value. Supplies of straw and inferior hay are then in demand. To make the most of such, an admixture of lucerne hay or bran should be provided, the necessity to purchase or relative prices to be considered. Various grains also should be used to improve the ration. Molasses is a valuable adjunct on account of its laxative properties and for increasing the palatability of inferior fodders. When all the fodders have to be purchased, it is wise to buy the higher grades and feed on a well balanced ration.

2. Glen Innes Experiment Farm.

R. H. GENNYS, Manager.

Daily Rations.

(*a*) *Spring.*—1st September to 30th November:—15 lb. chaff, 3 lb. oats, 4 lb. maize, split up as follows:—

	Morning.	Noon.	Evening.
Chaff	6 lb.	3 lb.	6 lb.
Grain	2½ ,,	2 ,,	2½ ,,

(*b*) *Summer.*—1st December to 28th February:—10 lb. chaff, 7 lb. oats, split up as follows:—

	Morning.	Noon.	Evening.
Chaff	4 lb.	2 lb.	4 lb.
Oats	2½ ,,	2 ,,	2½ ,,

(*c*) *Autumn.*—1st March to 31st May:—15 lb. chaff, 3 lb. oats, 4 lb. maize, split up as follows:—

	Morning.	Noon.	Evening.
Chaff	6 lb.	3 lb.	6 lb.
Grain	2½ ,,	2 ,,	2½ ,,

(*d*) *Winter.*—1st June to 31st August:—20 lb. chaff, 7 lb. maize, split up as follows:—

	Morning.	Noon.	Evening.
Chaff	8 lb.	4 lb.	8 lb.
Maize	2½ ,,	2 ,,	2½ ,,

4 lb. bran twice in a week.

In summer the lighter and less heating oats only are given. In winter the heavier and more heating maize only is given. Bran is fed to keep the bowels in loose condition when dry foods only are available; when there is green food such as grass, barley, &c., the bran may be left out. If the animals are neither stabled nor rugged, more feed should be given to balance the loss of heat. The animals here are always turned out at night, but in cold weather are invariably rugged.

TIMES OF FEEDING THROUGHOUT THE YEAR.

Morning ...	5·30 a.m. to 7 a.m.
Midday ...	12 noon to 1 p.m.
Evening ...	5 p.m. to 6·30 p.m.

As larger rations are provided in winter time, the horses' time of feeding is half an hour longer, both morning and evening.

NOTES.

It will be seen that the ration varies in the different seasons. For instance in summer, our best period for working horses as far as grass is concerned, the volume of feed is diminished, whilst in the winter it is nearly doubled. In spring and autumn the rations are moderated according to the greater or less value of the pastures at the time.

The natural pastures in New England, on which the farm horses are run, are almost devoid of nutriment in the winter months; with some of the introduced grasses, however, for the horses to depasture on, the case is altered, and often much less than the prescribed rations may be given.

The quality and nutrient value of the pastures should both be taken into consideration with working horses. At any time it is well that increases or reductions or changes of food should be gradual, and regard should be paid to their fodder value.

When horses are not in active work the feeding is altered, generally as follows:—

In spring, two feeds a day of 2½ lb. chaff each feed.

In summer, no feed other than the pastures, if they are good.

In autumn, two feeds a day of 2½ lb. chaff each feed.

In winter, two feeds a day of 4 lb. chaff each feed.

Sometimes in spring and autumn the horses may do a portion of these seasons without feed other than grass when spelling. September and May, however, are often as severe as the winter months.

In abnormal seasons, when some of the usual fodders are not available, the following can be used with some success with working horses:—

(*a*) When no grain is available, increase the chaff ration to half as much again.

(*b*) When oaten, wheaten, lucerne, clover, or best grass hays are not available, straw chaff, with a little bran, may be mixed up and damped, either with water alone or molasses solution, say, 5 water to 1 molasses. In no case should matured straw, from which the grain has been thrashed, be fed to stock quite dry, and in poor stock it may tend to hasten death, as the juices of the stomach are not able alone to deal with such hard, dry material.

The grain ration, when straw is fed, should be increased to half as much again. Barley may be used sparingly instead of oats, but wheat should be always boiled.

(*c*) Lucerne, clover, and meadow hay are always good substitutes for wheaten or oaten fodder in same quantity; but as they are much softer and contain no seed, the grain ration should be increased to (say) a quarter as much again.

(*d*) For horses taken off active work, and especially for brood mares with foals, lucerne and clover hay are preferred on account of their milk-producing qualities and high protein content for tissue formation; 25 lb. of hay are given to each brood mare in winter.

(*e*) The value of red clover paddocks for brood mares and foals is undoubted in spring, summer, and autumn.

(*f*) Carrots, pumpkins, and watery foods may all be used gradually and very sparingly in aiding very dry fodders.

(*g*) In very hard times, cocky chaff, and even cornstalks and husks, may be of value to fill up horses; but an endeavour should be made to supply something in the way of a laxative food such as molasses.

An area should be provided sufficient to produce the quantity required approximately for the year for farm horses, based on the experience arrived at in a bad season. No hard-and-fast rule can be given, but the worst produce on the farm should not be reserved and expected to supply the immense amount of energy required for the work of the farm horses.

The general health of the horses should receive attention, such as keeping them free from worms and other parasites; and they should be supplied with plenty of salt at all times, and made comfortable by grooming, well-fitting harness, &c. Plenty of good water at proper times is very important indeed. The horses here run at night in a paddock well supplied with water and the following rules are generally complied with:—Water is laid on in a trough at stables, and the first drink given is after the morning feed, before proceeding to work. A moderate drink only is given when the horses are heated before the midday meal, and as much as they like after. The same applies to the evening feeding.

Dust, and all mouldy bad stuff, should be kept out of horses' feed as much as possible. It is suggested from experience that kurrajong and she-oak are good for horses out of work in droughty times.

The above remarks are compiled from notes of the Farm Foreman, Mr. B. Cooney.

WESTERN SLOPES.

Cowra Experiment Farm.

M. H. REYNOLDS, Manager.

THE following notes explain the feeding of draught horses in work at the present time (May, 1912):—

Times of Feeding.—6 a.m. to 7·30 a.m., 12 noon to 1 p.m., 5·30 p.m. to 7 p.m.

Feed Ration for six days a week.—Oaten or wheaten chaff, 18 to 23 lb. for three feeds, or 6 to 8 lb. per feed; crushed oats or wheat, 9 lb. for three feeds, or 3 lb. per feed.

The heavier and hard worked horses receive the maximum. At night they are turned into a grass paddock. When turned into a bare paddock, good oaten or wheaten straw is placed in the paddock for their use at night.

For feeding light-harness horses in work :—

Times of Feeding.—Same as for draughts.

Feed Ration for six days a week.—Oaten or wheaten chaff, 15 to 18 lb., for three feeds, or 5 to 6 lb. per feed; crushed oats or wheat, 6 to 9 lb. for three feeds, or 2 to 3 lb. per feed. These horses are also supplied with straw at night if the pasture is bare.

All the horses receive a bran mash once a week (bran mixed in hot water), each horse receiving 3 lb. of bran in this way once a week. They also receive 1 oz. of Epsom salts mixed in their feed dry on Saturday evenings. All working horses are fed once a day on Sundays on the same scale as on week-days.

The change from crushed oats to crushed wheat is made gradually—that is, less oats are given each feed and more wheat until the full wheat ration is in use.

In periods when the pastures are good, the working draught horses receive 16 lb. chaff and 9 lb. crushed grain per day; and working light horses, 11 lb. chaff and 6 to 9 lb. crushed grain.

In the mangers of horses which bolt their feed, large stones are placed so as to prevent them from getting big mouthfuls.

Whenever it is noticed from the excrement that the food is badly digested, the animals' teeth are looked to, and if necessary, the rasp is brought into use to remove sharp edges or inequalities.

Any horse taken off work receives one feed daily for one week on the same scale as when working. When the pastures are good, horses out of work, after a period of seven days, receive no supplementary hand-feeding. When natural herbage is scarce, the stock depending on the pastures are watched, and when less nervy or active than usual, or failing in condition, hand-feeding is adopted.

Our young horses and others out of work, and at present running on dry, rough, spear-grass pasture, keep up their condition and activity by being fed twice a week on the following mixture :—

Silage (wheaten)	100 lb.
Chopped straw	100 „
Molasses	60 „
Crushed wheat	60 „
Water	40 „

The straw is moistened with molasses water, and the whole thoroughly mixed; and 25 lb. of the mixture are allowed for each animal twice per week.

For the use of the horses on the Farm, 45 tons of hay are needed per annum, but 60 tons are allowed for in case drought, &c., necessitate increased hand-feeding. The basis of hay-reserve upon which I am working at present is 1½ years' supply in hand, viz., 90 tons. When good seasons follow one another, and good hay returns result, we will have a quantity of hay in excess. This will be sold.

From the experiment area, 8 tons of hay are yearly obtained on the average, and yearly additional areas are set apart for hay, so as to ensure a constant supply of new hay. The estimate of yield of hay is based on 1 ton to 25 cwt. per acre.

RIVERINA.

Wagga Experiment Farm.

G. M. McKEOWN, Manager.

OATS, grain or hay, are not used as feed for farm horses at this Farm on account of the danger of undigested grains passing through the animals and germinating with the wheat, which is grown mostly for seed. Wheat and barley grains are largely used, but to improve digestibility, both are always either scalded or slightly boiled. Maize is rarely used, and then only in the winter. Wheaten hay is almost the only hay used, and always in the form of chaff.

The daily ration for horses in full work is from 20 to 30 lb. of chaff, the larger being for the heaviest horses used on the Farm (1,100 lb. or upwards). Wheat or barley is added, 4 lb. dry weight or 6 lb. soaked, per day. Twice a week bran is given at the rate of 4 lb. per horse.

When the horses are feeding partly on pasture, a reduction is made, proportionate to the time spent on pasture. None of the horses are stabled at night, except the few required for emergencies.

The horses are fed at 4·30 a.m., start work at 7·30 a.m., have an hour for the midday meal at noon, and are fed again after knocking off at 5·30 p.m. When on ordinary field work they are allowed to drink immediately on coming in, and have access to water while feeding. In summer they are hosed down at the close of the afternoon's work. In cool weather they are rubbed down to free them from sweat.

Rock-salt is always provided in the manger, and for horses not at work it is available in the paddocks.

Horses not in work are not stable fed when plenty of pasture is available, but in a season like the last, all idle horses, including colts and fillies, receive a ration of barley or wheaten straw, the former preferred. Brood mares get a little wheaten chaff when advanced in foal, and bran is provided when they are in milk, unless the natural pastures are quite sufficient.

2. Yanco Experiment Farm.

F. G. CHOMLEY, Manager.

THE draught horses at Yanco, which are of a light weight (active draughts to delivery sorts) are not kept at any particular work for any lengthened period; consequently, no routine system of feeding or management is practised as would be necessary with omnibus or carriers' horses, or upon a farm producing a large area of one crop. Generally the feed given to supplement pasture is chaff, cut from wheaten, oaten, or skinless barley hay, and when doing any heavy work, such as double-disc harrowing, ploughing, or drill work, a quart of oats is added to the chaff per feed.

The horses are all fed (30 lb. to 35 lb. per day) at 6 a.m., 12 noon, and 5·15 p.m., with lucerne hay in open rack during the night. If not doing any heavy work all horses are turned into paddock from 12 noon Saturday to Sunday afternoon. They are also allowed on to lucerne, and sometimes irrigated grasses, such as Rhodes, *Paspalum dilatatum*, *Phalaris bulbosa*, *Eragrostis pilosa*, sorghum, and patches of milk thistles and crowfoot.

When the pastures are good very little hand-feeding is required, and what is given is on account of convenience of having the horses at hand. Our pasture grass is always good when there is any—the native grasses growing here are splendid for horses, and they work and travel on grass often as well as hard-fed horses.

As pointed out previously, we never have long spells of one class of heavy work—a week's ploughing, &c., is as much as we would have, and then a change of work—therefore, it is not necessary to make much provision for changing feed. Even with our limited stable accommodation, we could separate one horse from another, night and day, and portion out the feed individually. Abnormal seasons under irrigation would reduce the quantity of native pastures, and make it necessary to feed more on lucerne hay, and wheaten and oaten chaff.

Roughly, half a ton of chaff per horse per month is provided, but as it is not known for what horses provision will have to be made, owing to continuous additions to the area, more hay has been kept during the last two years than the above estimate. It is often better to be able to sell than to be obliged to buy. It may be that sales will be made at a low price, but it is certain that purchases will be at a very high price.

All crop for hay, especially wheat, are cut when in flower. Mice will not trouble the fodder, like they would if the grain were set, and the stacks will last longer. Build the stacks with plenty of outward slope of sheaves. Never mind if the stack does not look like a building—it will keep dry, while many better looking stacks will have taken in rain.

Rug the horses, if possible; keep them warm by feeding them in a shelter, or among scrub and timber; and, when possible, give them some long feed to munch during the night.

3. Howlong Viticultural Station.

H. G. WHITE, Superintendent.

WE do not stable any of the horses at night. Horses required for the day are brought into the stables in the morning about 6·45, and fed and groomed, and leave the stable about 7·30 a.m. to work. They return to the stable at 11·45 a.m., resume work again at 1 p.m., and finish work at 5 p.m. The evening meal is given to them in the paddock.

FEEDING IN NORMAL SEASONS.

6·45 a.m.—Chaff, approximately 4 lb. per head.
11·45 a.m.— „ „ 4 „
5 p.m.— „ „ 3 „

The last meal is given in the paddock, and we find from experience that if grass is fairly plentiful many will leave the chaff. In the spring, when the grass is green and plentiful, we omit putting out any chaff in the evening.

During February, March, and April they get a ration in the evening of green maize at the rate of about 6 lb. per horse.

When off active work, feeding with chaff is omitted at midday in fairly good seasons, but if grass is not abundant they are fed about 9 lb. of chaff per day.

RATIONS IN ABNORMAL SEASONS.

We have always had a good supply of chaff, which is fed to the horses three times a day. During the summer months, when grass is usually dry and scarce, we have the green maize. In winter, when grass is scarce, they receive about 15 lb. of chaff each.

MAKING PROVISION FOR HORSE-FEED.

To guard against bad seasons I have aimed at having on hand an extra stack of hay, if possible as much again as what will be actually required. This season (which has been a bad one) we have had abundance of chaff.

We find a patch of maize a great saving on the dry feed, but with us the success of this crop is assured, as we are able to irrigate when necessary.

WESTERN PLAINS.

1 Nyngan Demonstration Farm.

H. J. KELLY, Manager.

THROUGHOUT the year the horses are fed in open stables, each horse from a separate manger. The feed is given regularly, three times daily, at 6 a.m., 12 noon, and 5·30 p.m. The quantity varies according to the seasons and the condition of the pastures.

In winter, during an average season, when some grass and herbage are available, an average ration would daily comprise about 18 lb. chaff, 7 lb. bran, and 5 lb. pollard, or 10 lb. maize instead of the bran and pollard.

Oats have not, so far, been used at this Farm, but should prove superior, especially in summer, to the concentrated foods above mentioned.

During the summer months, when the pastures are good, the above ration can be considerably reduced, giving light feeds morning and evening, and less than a third of the daily ration at midday.

When the horses are taken off active work, in favourable seasons, feeding is unnecessary.

In very dry seasons, when no grass is to be had, the amount of chaff will require to be increased.

In planning the year's cropping, allowance is made for the growth of sufficient hay for the Farm requirements. So far all concentrated feed has been purchased from other districts.

During exceptional periods of drought the nature and amount of work required would control the method adopted and the quantities given; while, in very good seasons, considerable work can be accomplished by feeding on grass alone, if the hours of labour are not too long.

2. Coonamble Experiment Farm.

W. LINDSAY, JUNIOR, Manager.

HORSES are stall-fed three times a day, viz., 6 a.m., 12 noon, and 5 p.m.; each horse receiving 1½ lb. maize, ¾ lb. bran, and 8 lb. chaff at each feeding. The horses always have access to a lick of rock-salt.

If pastures are green and succulent, bran is omitted altogether from the above ration, and maize is reduced to 1 lb. per feed. During summer months oats are substituted for maize.

Horses not doing active work only receive two feeds per day, viz., 6 a.m. and 5 p.m.; and when grass is plentiful and carries a good body they are only grass-fed.

In abnormal seasons, grain and bran are increased in the ration, and all horses have access to feeders containing chaff only at all times during the night.

It is intended to sow a hay crop of 100 acres annually to ensure a supply of chaff for horses, and about 10 acres of maize will also be sown.

COLIC.

THE following remarks are reprinted from the article by Mr. C. J. Sanderson, M.R.C.V.S., Government Veterinary Surgeon, in the *Gazette* for June, 1910, and will make a fitting conclusion to these reports:—

An article on "Derangements of the Digestive Organs in Horses" appeared in the January, 1910, number of the *Gazette*, page 11, and the treatment there advocated should still be followed, where possible, as any treatment now suggested is only to meet emergency cases, or to stop a gap till other and more effective remedies can be obtained.

As colic in one form or another is one of the commonest diseases of equines, and is responsible for the loss of a large number of horses annually, a few remarks on prevention will be of interest to horse-owners in general.

Owing to the fact that the term "colic" is applied to any abdominal pain, and that there is seldom any attempt made to differentiate between pain caused by such diverse causes as calculi, strangulated hernia, intussusception of the bowel, and pain caused by undigested food, it is certain that there will always be cases of colic reported.

The total amount of colic can be vastly reduced, however, by suitable feeding and watering, careful attention to the teeth, and working the horse on common-sense principles. No attempt will be made in this present article to deal with either of these subjects exhaustively, but the main points in connection with the prevention of colic will be mentioned.

Watering.

Horses require anything from 5 to 15 gallons of water a day, the quantity depending on the temperature and the amount of work performed. The water should be as pure as possible, clear in appearance, and free from taste, colour, or smell. Pure water is just as essential to a horse as it is to a man, and it is a mistake to suppose that a horse can drink badly contaminated water with impunity. Water obtained from pools or shallow wells, contaminated with surface drainage, or containing decomposing organic matter, frequently causes diarrhœa, and generally predisposes to colic. Water that contains a large amount of sediment should not be given, as the sediment causes a mechanical irritation of the mucous membrane of the stomach and intestines —*i.e.*, sand colic. When at rest in the stable, water should be given three times a day, and should invariably be given previous to feeding.

This latter point is of considerable practical importance. A horse's stomach is small in proportion to its size, and water does not remain in it, but passes through the stomach and small bowel to the cæcum, or water-gut. If water is given after feeding, besides weakening the digestive juices, a considerable portion of the food in the stomach and small intestines will be washed out in an undigested state, and indigestion and colic may result. Water in small quantities can be given within an hour or so from the completion of feeding if desired. After a long journey, a good plan is to water a mile or so before the journey's end, and take the horse slowly in afterwards. This prevents chills and colic, due to the ingestion of a large quantity of water when in an exhausted state. An animal after prolonged exertion or fast work has his system depleted of fluid. He will not eat sufficiently until his thirst has been satisfied; therefore, the water should come first, and while the animal is still warm is the best time to give it. After standing, the body temperature falls, and to give cold water freely then is only to intensify the effect of the cold water on the system.

Feeding.

A consideration of the anatomy and physiology of the horse's stomach will greatly assist in understanding the digestive derangements which produce colic. The stomach is a bag-like organ with two openings, one from the gullet and the other to the bowel, and, as already stated, it is remarkably small. It has powerful muscular coats for the purpose of kneading and churning the food, and it manufactures a digestive fluid called gastric juice in very large quantities. The capacity of the organ is from 25 to 30 pints, and digestion is most rapid when two-thirds full. In respect to this latter statement, it has been found that an immoderately large feed will put back digestion for hours beyond the normal period. It is obvious that the small stomach of a horse necessitates that it must be constantly refilled in order to dispose of the large amount of food required by the animal. Food is not meant to stay long in the stomach or first portion of the intestines, and in the three or four days which it takes to go from the mouth to the anus, all but a few hours is spent in the large bowels at the end of the intestinal tract. Food should be digested and passed out quickly, and anything which causes retention of food in the stomach is liable to produce colic. To ensure rapidity of stomach digestion, it is essential that the food shall arrive in that organ in a properly prepared state. It must be thoroughly masticated and well mixed with saliva, and the better masticated the more easily is it digested in the stomach.

For perfect mastication the teeth must be in good order. Frequently in young animals mastication is imperfectly performed, due to faulty shedding of the first teeth ; while in older animals, the edges of the teeth become so long and sharp that mastication becomes almost impossible. Horses so affected will bolt their food without proper crushing, and this of itself frequently causes colic through fermentation in the stomach. Teeth should be examined occasionally, and treated if necessary, as, apart from colic, faulty teeth are responsible for great loss of condition.

If small balls of partly chewed food are found in the manger, watch the horse eating, when it will probably be found that he gives two or three rapid movements of the jaws, and drops the food from the mouth. This process is known as "quidding," and indicates that the teeth are badly in need of attention.

While on the subject of proper mastication, horses whose teeth are in good order frequently bolt their food from habit. This should be prevented by mixing chaff or dry bran with the grain, and by placing several large stones in the manger to prevent bolters from securing too big a mouthful at a time.

Another cause of bolting is the practice of giving boiled food. This is not only unnecessary but often distinctly harmful. Boiling does not increase the digestibility of food, but permits of bolting without mastication and sudden overloading of the stomach. Further, boiled food, if not given directly it has been prepared, is apt to undergo fermentation. Linseed is the only food that requires boiling before use.

Should a horse's stomach become overloaded he cannot relieve it by vomiting, as, owing to the anatomical arrangements, vomition is impossible. To this danger must be added the further one that the pressure of food in an overloaded stomach may cause the opening into the small bowel to become closed also. When this takes place, food is imprisoned in the stomach, and after a short time will ferment, and ultimately, owing to the stretching of its walls, the stomach will become paralysed. Cases of this sort frequently occur, and rupture of the stomach is not an uncommon sequel.

The practical means of avoiding this and other stomach troubles is to give small feeds at frequent intervals, and to be especially careful with exhausted horses, mares in foal, young stock just being broken in, and animals in poor condition. In the case of the two latter, the involuntary muscles of the bowels are in just as soft condition as the external muscular system, and are not capable of dealing with large quantities of food at a time.

Perhaps the commonest cause of colic is giving horses food to which they are not accustomed. A sound physiological reason exists for not doing this. It has been proved that the character of the food influences the quantity and quality of the gastric and pancreatic juices. A definite and constant diet produces juices capable of digesting it, but utterly incapable of dealing with sudden changes of food. Under proper conditions, no food will cause colic, although some (as for example, wheat and barley) are more indigestible than others; but many foods will do so if given in excess, or at the wrong time, such as giving lucerne to a horse that has been starved for a time. Horses can be made to exist on practically any food that is digestible, provided they are gradually accustomed to it; but to give a horse a full feed of, say, maize, if he has never had the grain before, is to invite digestive troubles that may cause death. Again, grass-fed horses suddenly put on to dry feed on being taken on a long journey, get colic, owing to the sudden change of food.

If you wish to avoid colic, give food at regular intervals, and see that the food is of good quality and of proved dietetic value. Mouldy corn, damaged oats, or musty hay, very often produces colic, while proprietary foods of unknown composition and frequently of doubtful feeding value also, often do a great deal of harm. Do not give green forage in an immature, fermented, or over-ripe condition.

Bran mixed with maize is a favourite food, but it is much too laxative for a horse in work, and is a frequent cause of an attack of colic.

Do not give large quantities of bran to a working horse. Bran is a good food to maintain the contents of the bowels in a soft condition, and to keep them acting, especially during periods of rest; but its nutritive value is practically nil owing to all the flour being extracted from it.

Do not suddenly alter the amount of food given. It is a common practice to have horses fed up for a day or two prior to severe work, and this causes much intestinal trouble, such as stomach staggers.

Never forget that young horses cannot digest as much corn as old ones. Horses when rested, even for a day or two, should have their food, especially corn, reduced. Failure to do this is the cause of much colic.

Another common cause of repeated slight attacks of colic, especially with working horses on farms, is the dry, rough, coarse and indigestible nature of the herbage found in many paddocks. Too much coarse food prevents digestion by reason of its irritative effect on the stomach. A certain amount of bulky fodder increases the digestibility of the more concentrated foods, such as oats, but too great a quantity of such food greatly weakens the power to digest. A good example of the results of this is seen in so-called "wild melon poisoning." The horse's stomach is not adapted for the digestion of coarse food, and any coarse food that it eats is digested in the large intestines. Farm horses, as a rule, eat far too much rough bulky fodder, and many suffer in consequence. A working farm horse does not require more than 12 lb. of hay a day, and the rest of the ration should be made up of grain, such as oats, or half oats and corn.

Watch for symptoms of indigestion, such as an offensive smell in the mouth, and the presence of undigested oats or other matters in the fæces. The condition of the skin is a good aid to detecting commencing digestive trouble; for example, the sudden swellings of nettle rash, and the irritation, and often eruption, shown by horses too highly fed. Such observation will often prevent colic, as the necessary measures (such as reducing the quantity of food given) can be adopted. A factor that cannot be overlooked in the causes contributing to colic, is the way young stock are starved during periods of drought. Every farmer must realise how such periods of poverty must weaken every organ of the body, especially the disgestive organs, and this weakened condition frequently results in attacks of colic when the horse is subjected to the strain of work.

Major-General F. Smith, of the Army Veterinary Department, in his work on Veterinary Physiology, makes the following statement:—"Apart from obvious explanations as errors in feeding, the most common cause of digestive derangement is work. It is this which accounts for the majority of colic cases occurring towards the end of the day, the frequency with which the seizure occurs at or shortly after work, especially that of an exhausting nature, and the practical absence of colic among non-working horses." Every practical man knows this statement to be correct, and it is quite recognised that work interferes with normal digestion. Feeding in relation to work is a big subject, but the following points should be noted: Regularity of feeding and regular but not excessive work, are great factors in preventing digestive diseases. Personally, I am strongly of opinion that the length of time a horse works without resting or feeding has more to do with colic induced by work than any other cause. Do not work a horse more than two or three hours at a time without giving him a short rest, especially if the work be severe, and the rest should be without harness. A few mouthfuls of water and food during those short rests is good also.

As already pointed out, horses must not be worked on a full stomach. A fall in draught, or even a bad stumble, may, on a full stomach, cause rupture of the diaphragm (midriff) or rupture of the stomach itself.

To sum up, see that a horse does not start work on a full stomach, and do not give big feeds of any sort, but more especially bulky food, during work. Small feeds on the road, and the main bulk of the food, especially hay, after work, is the best rule; but even then, do not give feed too soon after a hard day's work—wait till rest has restored the animal's digestive powers to the normal.

Of colic remedies such as can usually be obtained, I would recommend the following:—

1. *Baking Soda*—Give 2 oz. (4 tablespoonfuls) in a pint of water.
2. *Powdered Ginger*—Give 2 tablespoonfuls in a pint of warm water.
3. *Ground Black Pepper*—Give 1 tablespoonful, shaken up, in a cup of oil.
4. *Turpentine*—Give 2 oz. (4 tablespoonfuls) in a pint of linseed oil. Shake well when drenching.
5. *Powdered Charcoal* in any quantity is useful in flatulent colic. This can be given in thin gruel.
6. *Whisky,* in half-pint doses, well diluted with water, combined with two tablespoonfuls of powdered ginger, yields good results.

Of the remedies mentioned, Nos. 1, 2, 3, 5, and 6 can be repeated, if necessary, several times at intervals of an hour. No. 4 can be repeated once after four hours' interval.

If linseed oil is not available, the turpentine can be given well shaken in a quart of milk.

Rectal injection of warm soapy water, given with a large syringe through a piece of rubber hose pipe 4 to 5 feet long, is good treatment. Six quarts should be given at a time, and repeated in an hour if required. The end of the pipe should be smooth, and it should be oiled before introducing it into the bowel. The whole length of the pipe should, if possible, be inserted, but no force must be employed to do this.

In flatulent colic, tobacco water is sometimes used as an enema with advantage. To make this, take 8 to 10 inches of twist tobacco, put into a quart of boiling water, strain, and when about the heat of freshly drawn milk, give as an enema. Mustard made into a thin paste and well rubbed on the outside of the abdomen is beneficial. Blankets wrung out of very hot water and placed over the abdomen, with a dry blanket outside to retain the heat, are also good. It is a good plan to keep the horse walking about when violently attacked with colic, as it prevents him injuring himself when lying down and struggling.

THE EXTENT OF IRRIGATION IN AMERICA.

THE total area under irrigation in the arid and semi-arid States of America is 13,739,499 acres. It has increased 82 per cent. during the past ten years, and 278 per cent. during the past twenty years. The total area of land in present projects and yet to be irrigated comprises 31,112,110 acres. The area susceptible of irrigation with the visible water supply is estimated at 50,000,000 acres. For 1910–11, the total area under all crops in Australia was 11,893,838 acres. So Americans irrigate more land than Australians cultivate altogether.

Sheep and Wool for the Farmers.

EXPERIMENTS IN THE DE-TAILING OF LAMBS.— THE SEARING IRON *versus* THE KNIFE.

J. WRENFORD MATHEWS.

THESE experiments were continued during the marking season of last year, not so much for the testing of the merits of the two methods employed as for the purpose of confirming reports already published relative to these modes of treatment for the de-tailing of lambs. The Farms selected on which the work was to be undertaken were the same as last year, comprising Wagga, Cowra, Bathurst and Glen Innes. With the exception of the last-named place, the lambs were operated on at the time usually fixed for marking in these districts, namely, July and August. At Glen Innes, however, the lambs were not treated until November, they being then about a month old. This age was observed at all the Farms where the methods were tested.

While last year's experiments furnish particulars of the work conducted for one year only, these now published show two years' observations. The Managers' reports submitted herewith are fairly consistent, and confirm the records taken during the two years' progress of the experiment. Any variations may be attributed to different local conditions. But for the fact that the male lambs at the time of marking were divided from the ewe lambs, and half of each sex treated and weighed separately, the experiments were conducted on precisely the same lines as in 1910, particulars of which were published in the July, 1911, number of this *Gazette*.

This slight alteration in the mode of procedure was found necessary as a result of that year's work. It was made in order to compare the effect on the ewe lambs, which are only de-tailed, with that of the severer process in the case of the ram lambs, which are both de-tailed and castrated.

Except at Glen Innes, where the Leicester supplanted the Romney Marsh, the same crosses were selected at each of the Farms concerned. Those comprised Lincoln, Leicester and Border Leicester-Merino cross lambs. This precaution was taken in order to guard against any variation in development that might occur, due to the earlier maturing qualities of certain breeds as contrasted with others, and the effect caused by these characteristics in the subsequent later or earlier development of their progeny, as the case might be. Thus the lambs representing each of these crosses were equally divided, one half being operated on with the searing iron and the remaining half with the knife.

The following are the essential particulars on which information was sought and furnished to the Managers, in order to ensure accuracy and uniformity in recording the results of the trials. These are supplemented here for perusal and general information :—

1. That the lambs be treated one month after birth.
2. That, in separating the lambs for treatment, the number of each cross be equally divided, and that each group for the searing iron be as uniform as possible in size with those which are to be treated by the knife. This may be accomplished by having lambs of equal ages represented in each group; wether lambs to be treated and weighed separately from ewe lambs.
3. That four weighings be conducted at monthly intervals and as near as possible on the same date of the month in each case.
4. That every lamb which dies during the progress of the experiment be subjected to a veterinary examination, unless any deaths be attributed to very apparent causes.
5. That for the first two months the lambs be inspected, and the nature of the sore and progress of healing be duly recorded.

The Conducting of the Experiments.

At Wagga, Cowra and Glen Innes the lambs comprising the whole year's drop, and at about a month old, were divided into their four respective groups, namely, seared and knifed wethers, and seared and knifed ewes, and placed under observation. Those at Bathurst were further subdivided into three representative groups. These groups were arranged in accordance with the time dropped, so that the lambs included in each group were of the same age when marked. Group 1 may thus be taken to represent the lambs which were first dropped; Group 2 to represent the lambs which were dropped a week later; and Group 3 to include all the later born lambs, and which are approximately two weeks younger than the lambs comprising Group 1.

This system of grouping was done in order to secure further accuracy, and it will be seen from the recorded weights, which are appended in tabulated form, that the results are most uniform.

It should be mentioned that the Border Leicester-Merino cross lambs at Cowra were, at the time of the first weighing, about eight days younger than the Lincoln and Leicester crosses; hence the lighter weights recorded for these lambs at this weighing. This deficiency, however, has more than been made up, as their relative proportional increases at the final weighings indicate. This is probably due to the influence of one or both of the following factors: The earlier maturing qualities of the Border Leicester breed, or the fact that the younger the lambs are marked the less check they receive.

The consistently heavier weights recorded for the lambs at Wagga may be attributed to two factors :—The bountiful season experienced there during that period of the year when the lambs were being reared, and the fact that special local conditions favour the production of heavier weight cross-bred lambs. On the contrary, the severity of the winter experienced at Glen Innes, together with the checks which the lambs received, due to worm infestation, accounts for the comparatively lighter weights of the lambs raised in that district.

The Healing of the Stump.

It was noted in the experiments formerly conducted that there was a striking difference in the nature of the sore and the healing of the stump between the two methods. The reports to hand, furnished by the Managers, fully confirm these points and bear out last year's observations. The seared tails took much longer to heal, and the stumps, as was noted in the trials carried out formerly, presented a nasty running sore, which ate into the bony protuberance of the remaining exposed portion of the tail. It was again noted that the knifed lambs exhibited little inflammation, and that the tails had, within three weeks after the operation, all healed. Many of the seared tails had not healed at the end of four weeks, and in some cases a discharge from under the scab was noticeable up to five and six weeks.

No actual deaths due to either method were recorded. One lamb died a short time after being operated on with the searing iron. The symptoms indicated that the cause of death was tetanus, but there was not sufficient evidence to show that it was the direct result of the de-tailing operation.

Summary of the Results.

As has been already indicated, the experiments in the first place were instituted to test the alleged superiority of the searing iron over the knife. The weights taken at all stages of development do not disclose any consistent evidence in support of this supposed advantage. The body weights, which are really the only reliable means of comparison, showed nothing to indicate that development had been checked. Even at one month after treatment—undoubtedly the most critical period—the records did not show that the lambs knifed had suffered any serious effects from the loss of blood.

From particulars furnished by the Managers, we gather that all the stumps, both seared and knifed, had healed perfectly at the end of two months. It is quite unlikely that the lambs would suffer from either method after that period. It might, however, be argued that the knifed lambs would still be suffering from a disadvantage owing to the extra blood lost at the beginning. To prove this, to carry out the experiment in its entirety, and in order to keep a further check on development, the weighings were continued until the lambs were weaned.

The Effects of Castration.

This is a point that has remained long in dispute, and the opportunity was taken to make it a subject for a practical test. It is often argued, especially among the breeders of early lambs, that owing to the severity of the operation, and the consequent check which the young lamb receives, those intended for early sale should not be castrated. All the lambs castrated were treated with the knife.

The following particulars were noted from the Managers' reports:—

At Wagga the wether lambs showed at the first weighing on an average an advantage of 4 lb., as compared with the ewe lambs. This advantage was not only maintained but increased, as is shown at the final weighing, in which case the average had been increased to 9 lb.

At Cowra the averages taken at the first weighing disclose no material difference between the weights of the sexes. The final weighings, however, show the wether lambs to average 4 lb. more than the ewe lambs.

Results from Bathurst favour neither sex throughout the whole period of observation; while at Glen Innes the wethers hardly retained the slight lead which they had at first.

From these results we might safely deduce that the extra pain and loss of blood involved in castration has little or no effect on the subsequent development of the wether, as compared with the ewe lambs; provided, of course, that the ram lambs are operated on at about the age of one month, as in this case.

Points to be Observed.

The appearance of the tail after the stump has healed is a point worthy of observation. When the tail has been carelessly severed, the bone is frequently noticed projecting beyond the flesh. Whilst taking the precaution of severing the tail at the right joint, as formerly noted, this condition may be almost entirely avoided by simply slipping back the skin towards the root of the tail, so that it is actually divided as far on the caudal side of the same vertebra as possible, and on being released on completion of the operation, it will cover and eventually heal right over the stump.

With a little practice this may be accomplished quickly and effectually. If the skin is pushed back, while at the same time the thumb is pressed into the tail in order to locate the joint, on the end being removed the skin first pushed back will return to its former position and thus cover the end of the stump. The knife also may be used as a means to assist in the operation. Instead of being slashed through the tail, as is commonly the practice, by slight pressure of the blade the outer skin can be worked back to the desired position, and de-tailing effected by steadily cutting through the joint at the point indicated.

Note.—The Experiments Supervision Committee have now decided that these experiments be discontinued, as sufficient information has been obtained.

WAGGA EXPERIMENT FARM.

G. M. McKEOWN, Manager.

The following lambs were used in the tests at Wagga Farm :—

Breed.	Seared.		Knifed.		Total.
	Wethers.	Ewes.	Wethers.	Ewes.	
Lincoln-Merino	14	9	13	10	46
Leicester-Merino	13	14	15	12	54
Border Leicester-Merino ...	13	16	14	14	57

A few crosses with the Down breeds were also included, but the numbers were too few to enable any conclusions to be drawn.

The average weights of the lambs at the different weighings are given in the attached table. The weighings were made on 31st July–1st August; 1st September; 30th September; and 30th October, respectively.

Taking the averages of all breeds and both sexes, the weighings show the following results :—

Weighing.	Seared.	Knifed.
	lb.	lb.
First	32·8	32·8
Second	44·14	46·8
Third	56·	58·15
Fourth	65·8	68·3

Notes.

All the wether lambs of each cross were taken first and divided evenly, in size as well as in number. The ewe lambs were next divided in the same way. Then the lambs to be treated with the searing iron were marked, so as to be easily identified from the ones to be done with the knife. One hundred and eighty-one lambs were equally divided in this way. Their weights were all taken singly and the lambs were tagged so as to be able to know every individual increase in weight.

On the 10th August, nine days after marking, the whole flock was brought in. No lambs had died up to this date, nor were any of them very bad in any way—nothing more than the usual stiffness in some of the ram lambs for the first few days after marking. Twenty of the largest and five of the smallest lambs subjected to each treatment were carefully examined.

Seared.—All of the 20 big lambs were found to have festered, and in most cases very badly, large quantities of pus having fallen into the wool in the crutch below the tail and formed into great clots on the wool. Swelling was also very pronounced in nearly all cases, but was confined to between the skin and the edge of the flesh, and did not extend very far up the tail. The smaller lambs were slightly better than the larger ones, and in some few cases, the outer edge showed signs of healing.

Cut Tails.—Of the 20 large lambs examined, 2 were found to have a a slight fester immediately opposite the bone, but no signs of swelling were found in any of them. In all cases healing had begun, and in 6 cases the unhealed surface had been reduced to about half, while in 2 cases it had been reduced to about one-third. In the balance, the unhealed portion would average about two-thirds. Of the 5 smaller lambs that were examined, 1 was almost healed, and the other 4 were about half healed; the unhealed portion being very clean and even, as was the case with all cut tails examined, with the exception of 2, which had a slight trace of fester; but it was noticed that the fester was confined to near the bone, and though there was a little proud flesh, it was very shallow, while the outer surface was clean and even, and showed a good healthy colour.

On the 15th August, fourteen days after marking, all lambs were examined—86 in each lot.

Of the *cut tails*, 8 were found to have healed, while in 20 cases the unhealed portion was no larger than a pea. Six were found to show signs of fester, and in 1 of the 6 the fester was running rather badly, but the proud flesh did not run very deep. Though the surface could not be said to have been reduced at all, none of the others were nearly as bad as this one, as most of the others had started to heal nicely. In the remaining 52, the surface had been reduced by about half, and this was covered with a thin clean scab, with no fester, and healing nicely round the edge.

Seared Tails.—Of the 86 examined, none were found to have healed. In 10 cases the unhealed portion was no larger than a threepenny piece, but only 12 were found in which the festering had ceased altogether, though the surface had been reduced to about half. In 25 the surface could not be said to have been reduced at all. In these cases the festering had been very great, as shown by the amount of pus gathered on the wool. Of the remaining 39, the surface had been reduced on an average to about one-third, with a very thick hard scab adhering to the wound, and on lifting the scab the wound showed in all cases a very uneven surface, as the proud flesh had eaten in fairly deep in some places, though at this stage most of the festering seemed to be coming from around the bone.

On 19th August, eighteen days after marking, one of the seared lambs was found with all the symptoms of tetanus, but it died within four hours after it was found, and as the weather was too warm, it was deemed inadvisable to send it down for investigation.

On the 25th August, twenty-four days after marking, all lambs of each treatment were examined.

Knifed.—Twenty-three were found to have healed, while in 12 cases the unhealed portion was about the size of a pea, and in 2 about the size of sixpence. One of these showed a little fester.

Seared.—Eighty-five were examined, 1 having died as mentioned above. Twenty-seven were found to have healed, 33 healed up to about the size of a pea, and 25 had healed up to about the size of sixpence, while 7 of these still showed signs of fester, and in 3 out of the 7 the festering was rather bad.

BATHURST EXPERIMENT FARM.

R. W. PEACOCK, Manager.

OWING to different ages of the lambs included in the experiment, it was deemed advisable to divide them into three different groups, Nos. 1, 2, and 3, and these lambs were de-tailed on 20th July, 27th July, and 3rd August, respectively. The lambs were examined each week, and the following notes were taken to show the progress made by the lambs in the comparative methods of treatment:—

Group No. 1—Lambs De-tailed on 20th July, 1911.

First Weekly Examination, 27th July, 1911.—When examined on this date it was found that all the lambs were healing satisfactorily, no bathing or other treatment being necessary.

Second Weekly Examination, 3rd August, 1911.—On this date the majority of the seared lambs had very large scabs, and had not nearly healed. Four or five had bad sores which showed signs of festering and proud flesh. These were treated with Jeyes' Fluid. On the other hand, a large proportion of the knifed lambs were practically healed, only two having scabs of equal size to those on the seared lambs.

Third Weekly Examination, 10th August, 1911.—All the seared lambs still had slight scabs, but there was only one of the knifed lambs whose tail had not healed entirely.

Fourth Weekly Examination, 17th August, 1911.—All the lambs in this group, both knifed and seared, were completely healed on this date, and no further examination was therefore necessary.

Group No. 2—De-tailed on 27th July, 1911.

First Weekly Examination, 3rd August, 1911.—All the lambs were healing satisfactorily on this date, but the knifed lambs had made greater improvement than the seared.

Second Weekly Examination, 10th August, 1911.—On this date the knifed lambs were practically healed, whilst those seared on the same date had small scabs.

Third Weekly Examination, 17th August, 1911.—The knifed lambs were completely healed, but those which had been seared showed signs of festering, and treatment with Jeyes' Fluid was therefore made.

Fourth Weekly Examination, 24th August, 1911.—The seared lambs were not quite healed, but those which had been subjected to the knifing process were completely healed. No further examination was made.

Group No. 3—De-tailed, 3rd August, 1911.

First Weekly Examination, 10th August, 1911.—When the first weekly examination of this group was made it was found that the knifed lambs were healing rapidly, but the seared lambs were not making such satisfactory progress.

Second Weekly Examination, 17th August, 1911.—The knifed lambs were completely healed on this date, and those which had been seared were healing satisfactorily, with the exception of one lamb whose tail showed signs of festering.

Third Weekly Examination, 24th August, 1911.—The knifed lambs were not examined on this occasion, as at the last weekly examination it had been found that these lambs were completely healed. The seared lambs were healing rapidly, but the scabs were still visible.

Fourth Weekly Examination, 31st August, 1911.—All the seared lambs were completely healed on this date.

A table showing average weights at the different weighings is appended.

COWRA EXPERIMENT FARM.

MARK H. REYNOLDS, Manager.

The lambs experimented on numbered 183, comprising the 1911 drop of the following crosses:—Lincoln-Merino, English Leicester-Merino, and Border Leicester-Merino.

Instruments used.

For Searing.—A sharp wedge-shaped iron. Two were used, being heated to a dull red colour for each operation.

For Knifing.—A special lamb-marking knife, disinfected in a 5 per cent. lysol solution before each operation.

Procedure.

In both processes the skin on the tail was drawn up towards the body; then the tail was removed to the second joint in the case of ewe lambs, and the third joint in that of the wether lambs, the wound being immediately dressed with Stockholm tar. At the same time the wether lambs were marked, the end of the scrotum being removed by a knife and the testicles drawn out, the wound then being dressed with Stockholm tar.

The following table shows the numbers treated of each cross:—

Cross.	Ewe Lambs.		Wether Lambs.	
	Seared.	Knifed.	Seared.	Knifed.
Lincoln-Merino	13	14	16	16
English Leicester-Merino ...	22	22	14	15
Border Leicester-Merino ...	15	15	10	11
	50	51	40	42

Total: Seared, 90; Knifed, 93.

The average ages of the lambs upon the date of operation were:—

Lincoln-Merino, 5¼ weeks.
English Leicester-Merino, 5¼ weeks.
Border Leicester-Merino, 4 weeks.

The weight of each lamb was taken on the day of treatment, viz., 27th June, 1911; and each animal was examined at intervals of a week thereafter, viz., 4th July, 11th July, 18th July, and 25th July. On the latter date (one month after being operated on), they were again weighed. Subsequent weighings were made on 25th August and 26th September, 1911.

At the commencement the knifed section showed an average weight of over 1 lb. above the seared section. The lambs in the knifed section were therefore probably better doers than those seared.

With searing there was comparatively no bleeding. In the knifed section, the older lambs in the Lincoln-Merino cross and English Leicester-Merino cross, bled much more than the knifed Border Leicester-Merino cross, which were younger lambs.

From the figures given in the table of results it will be noted that both the Lincoln-Merino and the English Leicester-Merino crosses showed a greater gain in the seared section for each of the three months, with both ewes and wethers, possibly due to the loss of blood in the knifed section. On the other hand, the Border Leicester-Merino cross showed a greater gain in the knifed section for each of the three months. The lambs of this cross weighed from 7 to 8 lb. less than the other two crosses at the time of tailing. The Border Leicester-Merino lambs were also younger and less sturdy than the others. Therefore the fact of the knifed section in the Border Leicester-Merino cross showing better weights may possibly be explained by stating that the searing iron is detrimental on young and weak lambs; or the fact that these younger lambs bled less when knifed, thus receiving but a slight check when operated on, would cause the knifed section to show the greater weights.

Average Monthly gains, Ewes and Wethers.

Cross.	First Month.		Second Month.		Third Month.	
	Seared.	Knifed.	Seared.	Knifed.	Seared.	Knifed.
Lincoln-Merino	9·84	8·04	13·84	14·45	9·3	9·54
English Leicester-Merino ...	8·43	8·1	13·43	13·23	9·	8·51
Border Leicester-Merino ...	10·72	10·155	14·7	15·285	10·17	11·83
Average of all breeds	9·66	8·76	13·99	14·32	9·49	9·96

General average gain in weight, all breeds, for a period of three months to 26th September, 1911 :—Seared, 33·14 lb.; knifed, 33·046 lb.

Progress of Healing.

Two weeks after operating, no tails had healed.
Three „ „ —25 seared tails had healed, or 27·7 per cent.
—66 knifed „ „ 70·9 „
Four „ „ —86 seared „ „ 95·5 „
—93 knifed „ „ 100 „

Treatment given after Removal of Tails.

One week after operating 11 seared tails were treated with a 5 per cent. lysol solution. In the following week, 16 seared tails were so treated. Of these 16, 11 were not treated the first week. No subsequent dressing was given, and at no time were the knifed tails dressed. The lysol wash was given to tails on which pus had developed.

At the end of the fourth week after operating, only 4 tails had not properly healed, and these had all been seared. Two had sores the size of a pea, one of which had received no treatment; the other had been twice dressed with lysol solution. Of the remainder, one had a sore the size of a large pea, also pus; this tail was not at any time dressed with lysol solution. The fourth had a sore the size of a pea and containing pus; this tail had been once treated with lysol.

Healthy Conditions in Healing.

Of the knifed section, 5 tails, or 5·37 per cent, showed pus; but of the seared section, 53 tails, or 58·8 per cent., were so affected.

For comparative purposes, none of the seared tails should have been dressed with lysol solution, as none of the knifed section required it. However, only 16 out of 53 seared tails were dressed after operation. The dressing with lysol was given to the tails where pus caused a risk of fly trouble, but no instances of fly-blowing were recorded.

Deaths during the Experiment.

One Lincoln-Merino wether lamb died in the third week after tailing by searing, death being due to bloat (over-feeding on rape). One Border Leicester-Merino wether lamb died in the fourth week after tailing by knifing, death being due to scours, not attributable to the operation of tailing.

Summary.

Tailing with the searing iron takes longer than with the knife. The wound produced by the searing iron takes longer to heal and is more angry (the wound was in every instance covered with Stockholm tar). When flies are troublesome two dressings with a 5 per cent. solution of lysol may be essential with seared lambs, whereas with the knife the wound heals quickly, and no subsequent treatment is required other than covering the wound with Stockholm tar directly after the operation.

The seared section showed a greater gain in weight for every weighing of the Lincoln-Merino and English Leicester-Merino crosses. With the Border Leicester-Merino cross, the knifed section made the greater increase. However, in the aggregate the seared section made the better showing.

GLEN INNES EXPERIMENT FARM.

R. H. GENNYS, Manager.

The breeds comprised in the experiment were Lincoln-Merino, Border Leicester-Merino, and Romney-Merino.

The ages of the lambs at date of treatment averaged about three weeks. The following table shows the number of lambs at the commencement and end of the experiment:—

Breed.	Number at commencement	Number at end.	Number dying during the experiment.
Lincoln-Merino	63	57	6
Border Leicester-Merino ...	57	47	10
Romney-Merino	46	42	4
Totals	166	107	20

Only one death occurred during the first month after treatment, cause unknown; the remaining deaths were caused by a severe infestation of stomach worms (*Strongylus contortus*). There were no signs of tetanus.

The mode of treatment has been explained in the *Agricultural Gazette*, July, 1911, page 567.

During the second weighing (one month after marking) it was observed that 59 per cent. of the tails of the seared lambs had not healed, scabs being present up to the size of a sixpence, whilst only 14 per cent. of the knifed lot were scabby.

The appended table gives the average weights of the different crosses at the five weighings.

Experiments in De-tailing of Lambs.

TABLES showing Average Weights of Lambs at different Weighings.

A.—WAGGA EXPERIMENT FARM.

Dates of Weighings.	Lincoln-Merino (46)				English Leicester-Merino (54).				Border Leicester-Merino (58).			
	Seared (23).		Knifed (23).		Seared (27).		Knifed (27).		Seared (29).		Knifed (29).	
	Ewes.	Wethers	Ewes.	Wethers.	Ewes.	Wethers	Ewes.	Wethers	Ewes.	Wethers.	Ewes.	Wethers.
1911.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
31st July	29 12	32 8	30 4	33 8	30 4	41 4	32 8	32 12	29 0	34 12	30 8	32 12
1st September	43 0	48 8	44 4	48 0	42 12	44 0	44 8	45 12	43 0	48 0	44 0	47 8
30th „	54 0	63 0	56 0	63 0	53 0	56 0	56 0	65 0	53 0	61 0	55 0	61 0
30th October	61 0	73 0	63 0	74 0	61 0	65 0	63 0	68 0	62 0	72 0	63 0	73 0

B.—BATHURST EXPERIMENT FARM.

Dates of Weighings.	Lincoln-Merino.				English Leicester-Merino.				Border Leicester-Merino.			
	Seared.		Knifed.		Seared.		Knifed.		Seared.		Knifed.	
	Ewes	Wethers	Ewes.	Wethers	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.
1911.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
GROUP No 1.												
20th July	19 0	23 1	17 12	23 0	21 8	21 4	21 14	22 3	20 4	23 0	20 2	19 4
20th August	26 12	32 8	32 4	34 0	29 11	31 0	30 5	30 3	28 13	31 12	28 4	26 4
20th September	41 2	50 2	48 8	52 2	45 0	44 11	46 10	45 15	43 12	51 8	48 0	41 0
20th October	54 0	61 13	58 0	59 6	55 15	55 9	58 12	54 0	56 8	63 14	56 9	54 4
GROUP No. 2.												
27th July	20 14	20 10	19 10	23 4	22 4	21 14	17 0	21 7	23 8	23 0	23 12	21 13
27th August	31 8	32 8	28 12	34 10	36 0	34 10	27 8	32 4	34 8	34 13	29 4	32 10
27th September	43 8	46 2	39 6	46 13	49 2	47 6	37 0	45 7	47 15	47 8	50 0	45 6
27th October	54 10	58 13	53 7	62 14	62 8	60 0	57 8	60 1	60 9	61 5	65 4	59 13
GROUP No. 3.												
3rd August	No Lincoln-Merino lambs in Group No. 3.				19 8	19 6	20 2	18 4	16 10	19 14	20 8	20 8
3rd September					29 0	31 0	31 0	28 4	27 8	33 0	30 0	33 0
3rd October					48 4	43 10	45 12	43 0	45 12	47 10	44 6	46 0
3rd November					60 0	54 10	58 0	53 12	56 2	51 10	59 2	58 0

C.—Cowra Experiment Farm.

Dates of Weighings.	Lincoln-Merino (59).				English Leicester-Merino (73).				Border Leicester-Merino (51).			
	Seared (29).		Knifed (30).		Seared (36).		Knifed (37).		Seared (25).		Knifed (26).	
	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers	Ewes.	Wethers.
1911.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
27th June	33 11	34 2	34 1	36 12	32 11	30 0	32 10	35 1	25 1	24 9	25 1	23 8
27th July	43 6	43 9	42 4	44 9	40 11	38 12	40 8	43 6	36 6	35 11	34 12	34 3
27th August	57 0	57 10	56 8	59 5	54 0	52 4	53 0	57 8	50 10	50 13	49 6	50 12
27th September	66 10	66 10	64 13	69 4	62 0	62 4	61 2	66 4	60 4	61 12	59 12	63 0

D.—Glen Innes Experiment Farm.

Dates of Weighings.	Lincoln-Merino (63).				Border Leicester-Merino (57).				Romney-Merino (46).			
	Seared (30).		Knifed (33).		Seared (29).		Knifed (28).		Seared (24).		Knifed (22).	
	Ewes.	Wethers.	Ewes	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.
1911.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
20th November	24 8	26 9	26 2	27 6	26 12	28 1	18 13	28 2	26 9	29 12	29 13	28 4
20th December	39 7	41 7	40 0	44 2	42 3	41 13	32 9	43 12	40 13	42 6	44 3	43 4
1912.												
20th January	43 7	44 11	42 2	46 13	47 2	47 3	41 2	47 7	45 14	44 0	47 4	47 14
20th February	49 10	50 3	49 8	54 7	55 0	52 1	45 14	50 6	52 5	50 7	54 2	50 0
20th March	58 11	55 12	58 1	60 7	62 8	57 6	56 8	59 2	59 10	56 0	60 13	62 0

Ploughing Experiment.

NYNGAN DEMONSTRATION FARM, 1911.

E. BARING, Experimentalist.

THE depth of ploughing required in order to obtain the best results from the wheat crop, is a subject surrounding which there is a considerable amount of controversy. This is mainly due to the fact that the best depth of ploughing appears to vary very largely under different conditions of climate and locality, and with the nature and depth of the soil. This makes experiment work, in regard to the depth of ploughing, of small value outside the particular district in which tests are carried out.

Nyngan and the West Bogan country form a comparatively new district so far as agriculture is concerned, and at present no reliable data about ploughing can be found. With the object of supplying this information, the following experiment was initiated during 1911; and, as in experiments of this nature one year's results cannot be taken as conclusive, this experiment is to be continued for a number of consecutive years, until satisfactory and reliable data may be obtained.

Provision is also made in this experiment for testing the relative merits of disc and mould-board ploughs; the value or otherwise of subpacking the soil; of subsoiling; and of reploughing the ground.

This experiment was carried out in accordance with the general directions of the Experiments Supervision Committee. Twenty-two plots were required, the arrangement of which is shown in the table. The experiment was conducted on Section C, Paddock No. IV. The plots were 8·25 chains long and 28 links wide. It will be seen from the plan that every third plot is a check, ploughed 6 inches deep with the disc. Plots 17 and 18 were reploughed, and received the additional treatment shown in the plan.

Preparation and Planting of the Land.

This area was cleared early in 1911, and ploughed in February; then cultivated with the spring-tooth cultivator, and harrowed. The whole was planted on 24th April, 1911, the ground being rolled prior to planting, and rolled and harrowed immediately after planting. The ground was very dry, and contained insufficient moisture generally to ensure germination. Superphosphate at the rate of 30 lb. per acre was drilled in with the seed. Steinwedel was the variety of wheat used in the experiment. The hay crop received 532 points of rain during growth, and was harvested on 7th October. The grain received 670 points, and was cut on 25th November, 1911.

The results are given in the accompanying table. While conclusions cannot be drawn from this trial, it is worthy of note that subpacking does not appear to increase the yield, and subsoiling even seems to decrease it. The disc gave slightly better returns than the mould-board plough, and the results from the different depths of ploughing do not, this season at any rate, show in favour of deep ploughing.

TABLE of Results, Ploughing Experiment, Nyngan, 1911.

Plot No.	Ploughing.	Hay.			Grain.		
		Computed.	Natural.	Percentage.	Computed.	Natural.	Percentage.
		lb.	lb.		lb.	lb.	
1 *check*	Disc plough, 6 inches deep	1.485	1,485	100	189	189	100
2	,, 3 ,,	1.740	1,565	111·18	260	217·7	119·43
3	Mould-board, 3 ,,	1,670	1,645	101·51	295	246·3	119·77
4 *check*	Disc plough, 6 ,,	1,725	1,725	100	275	275	100
5	,, 4 ,,	1,715	1,685	101·78	265	255	103·92
6	Mould-board, 4 ,,	1,695	1,645	103·04	255	235	108·51
7 *check*	Disc plough, 6 ,,	1,605	1,605	100	215	215	100
8	Mould-board, 6 ,,	1.585	1,587·5	99·84	180	228·3	78·84
9	Disc plough, 6 ,, subpacked	1,475	1,570	93·94	190	241·7	78·61
10 *check*	,, 6 ,,	1,552·5	1,552·5	100	255	255	100
11	,, 8 ,,	1,425	1,518·3	93·85	191	221·3	86·31
12	Mould-board, 8 ,,	1,310	1,482·2	88·38	131	187·7	69·79
13 *check*	Disc plough, 6 ,,	1,450	1,450	100	154	154	100
14	Mould-board, 8 ,, subsoiled to 10 inches	1,350	1,411·7	95·62	225	171	131·57
15	,, 4 ,, ,, 10 ,,	1.240	1,373·3	90·29	180	188	95·74
16 *check*	Disc plough, 6 ,,	1,335	1,335	100	205	205	100
17A	,, 6 ,, reploughed	1,320	1,367	96·56	205	197	104·06
B	,, 6 ,, ,, subpacked	1,290	1,399	92·20	157·5	189	83·33
18A	,, 6 ,, subpacked, reploughed, subpacked	1,390	1,431	97·13	170	181	93·92
B	,, 6 ,, ,, ,, not ,,	1,350	1,463	92·27	210	173	121·38
19 *check*	,, 6 ,,	1,495	1,495	100	165	165	100
20	Mould-board, 6 ,, subpacked	1,432	1,423·3	100·61	151	147	102·72
21	Disc plough, 6 ,, ,,	1,390	1,351·7	102·83	160	129	124·03
22 *check*	,, 6 ,,	1,280	1,280	100	111	111	100

A Small Shearing Shed.

H. S. MAJOR, Assistant to Sheep and Wool Expert.

THE high price of land and the resumption for closer settlement of many large estates will greatly influence the size of future farms and grazing areas. Some New South Wales land, which a little time back was believed only to be fit for sheep grazing, is now profitably growing wheat, and the wheat belt is gradually advancing further west. It is reasonable to believe that most of the large flocks of 100,000 sheep and upwards will be confined in future to "out back" areas, far from railway communication and sea-board. In the more favoured areas, the smaller mixed farmer and grazier will predominate.

The wool-shed in the past has played a most important part in this great wool industry of Australasia. The many spacious and well appointed sheds which pastoralists have had erected have been in a great measure instrumental in establishing and maintaining the high standard of preparation for which Australian clips are renowned throughout the wool-using countries of the world. We must endeavour to uphold this reputation, though our flocks become smaller. Our competitors, South Africa and the Argentine, are making rapid strides—chiefly the former country, where the flock-owner is given preferential railway freight rates if he shears his sheep and prepares his wool by a certain method set down by the South African Department of Agriculture.

The accompanying plans of a six-stand machine shed, yards, &c., will, perhaps, be in keeping with the times, and assist many of those whose flocks demand the construction of a small shed. Good results cannot be shown when a classer is labouring under such disadvantages as insufficient room, small tables and bins, bad light, &c. In some sheds ample provision is made for the shearing, but the classer's department is neglected.

Position of the Shed.

The choice of a suitable site for the yards and erection of the shed is the first consideration. The ground should be high and well drained, and the nature of the soil should be considered with a view of combating the dust evil.

Should it be decided to elevate the shed (by doing which many advantages are gained), full use can be made sometimes of any irregular sloping of the ground. The floor of the shed should be level throughout, and while we have, perhaps, a big elevation at the loading stage, there may be only 4 feet over the chutes—all that is required. It is a bad arrangement when the shearing board and pens are some feet higher than the wool-room floor. If possible, have the length of the board and wool-room running in a north and south direction, so that full use is made of the early morning and late evening light.

The Plans.

Plan A.—This gives a general view of the whole, showing the arrangement of, and connection between the yards, sweating pens, board and wool-room.

Plan A.A.—This gives an elevation view. One end of the sweating pen has been removed to show interior construction.

Plan B.B.—Here we have a cross-section through the engine-room, board, catching pen and race. The plan also shows the vertical and overhead driving gear, either of which can be used. One chute and counting-out race is also depicted.

The plans are drawn to the scale shown on each. All dimensions represent interior measurements. Not much room is set out for stacking wool bales. The amount of space required depends on many conditions, and, moreover, no special mode of construction is necessary.

The Yards.

The number of sheep likely to be handled per day at shearing time, and at other times also, will decide the size of the yards.

The receiving yard, here illustrated, is 80 feet by 80 feet, and estimated to hold 1,600 grown sheep. From the receiving yard, sheep have access almost direct to the sweating pens—an advantage when a flock does not require any drafting. The two forcing pens approaching the drafting race can be emptied and filled alternately; and both operations are continuing at the same time in different pens. The swing-gate, hinged on the fence-post dividing the forcing pens and at the entrance to the drafting race, allows the passage of sheep from one pen while it shuts off the other pen when it is being filled up. By placing a temporary block in the race near the drafting gate, one forcing yard and the race can be filled right up.

The elevation of the sweating pens decides the slope and length of the incline by means of which the sheep enter from the ground level. The width of the incline is 8 feet. The two swing gates render the whole width of the incline available for sheep entering from either yard. These two gates are worked on the same principle as the one at the approach to the drafting race. The door at the top of the incline is best built on the slide principle.

The Sweating Pens.

The term "sweating pen" originated from Spain (*Sudadero* or *Bache*—the sweating room). In the early shearing days of Spain, sheep were penned very tightly, and nearly all ventilation was blocked up immediately prior to a flock being shorn. Though the sheep did not actually sweat, the close confinement and hot atmosphere had the effect of rendering the yolk more oily, consequently the wool "cut" easier. Pastoralists do not look upon sweating pens as serving this purpose at the present day; they have the "wet sheep" question and high wages for shed labour to deal with.

The sweating pens are generally built to hold and cover sufficient sheep for about one day's shearing. In this shed about 600 sheep could be sheltered over night.

The pens and race are floored with hardwood battens, about 1¾ inches wide, 1½ inches thick, and ⅝ of an inch apart. It is a good plan to have some of the battens built on movable sections, say, 6 feet x 4 feet, so that they can be lifted out bodily and the accumulation of dirt cleared away from underneath. The elevation under sweating pens in some sheds will permit a horse and dray to be backed under. This is useful, but costly, and hardly necessary. Around the side of the sweating pen part of the boarded wall can be either built out and permanently fixed for ventilation, or a hinged section made about 2 feet wide.

Catching Pens and Race.

In this department, elevation is also an important feature. By having chutes, the sheep, before or after being shorn, are not carried across the shearing board by the shearers. The actual time lost walking to and fro with sheep many times a day, together with the energy expended, are responsible for reducing a shearer's tally compared with other conditions by about ten.

The three catching pens, each 10 feet by 10 feet, are big enough to allow of two shearers catching from each one. The chute is here necessary to transfer the shorn sheep to the ground level and into each shearer's counting-out race underneath the catching pen.

The chutes must not be too abrupt, they can be built with a slight loop near the ground. Part of the catching pen floor must be raised and covered to make part of the passage way underneath. The higher the catching pens are off the ground the longer the chutes must be, and it is obvious also that more of the floor of the catching pen must be utilised. With a 4-feet elevation here, a short and fairly abrupt chute might be used. The counting-out pens begin at the point where the chutes meet the ground, so that they are partly covered by the catching pens, but extend for the most part well beyond, and there should be no necessity for a man to get under the pens to hunt sheep out when he is counting tallies.

Each shearer has a separate door to enter the catching pen. The opening is about 2 feet 4 inches wide, closed by two light half-doors, each working on two reversible spring hinges. This allows the shearer a forward entrance and a backward exit by his applying his body very lightly against the doors. When the doors are opened into the catching pen, very little room is occupied (only 1 foot on either side), and should the pens be too tightly filled, the doors can be opened towards the shearing board. Allowing for the space occupied by the chutes, each catching pen will hold approximately twenty sheep.

The Shearing Board.

The width of the shearing board and the distance between the stands is very important. Good work cannot be done at the rolling table if fleeces are trampled upon by shearers and pickers-up, or torn by sheep kicking. In some big single-board sheds, where pickers-up and broomies have to dodge shearers who are continually crossing the board, plenty of space is necessary, and the board should not be less than 10 feet wide. The board here illustrated is 8 feet wide, which is enough, because the pickers-up and broomies have a free passage up and down, unhindered by shearers, who catch, shear, and release their sheep on the one side.

When the shearer is standing with his back to the catching pen, the chute should be on his left, and the catching pen door on his right; the reverse arrangement would apply to a lefthand shearer. The machine will hang midway between the door and the chute.

When the sheep is nearly divested of its fleece, its head is almost in the chute, and only a small push is necessary to send it in. There is less likelihood of injuring sheep by this method. Where there are no chutes, the sheep have to be dragged across the board, and sometimes over the fleece, and they are subjected to much rough handling. Where there are no chutes, it is preferable to have the woolly sheep carried across the board and shorn alongside the counting-out races, than to shear them near the catching pens and carry or drag the shorn sheep across.

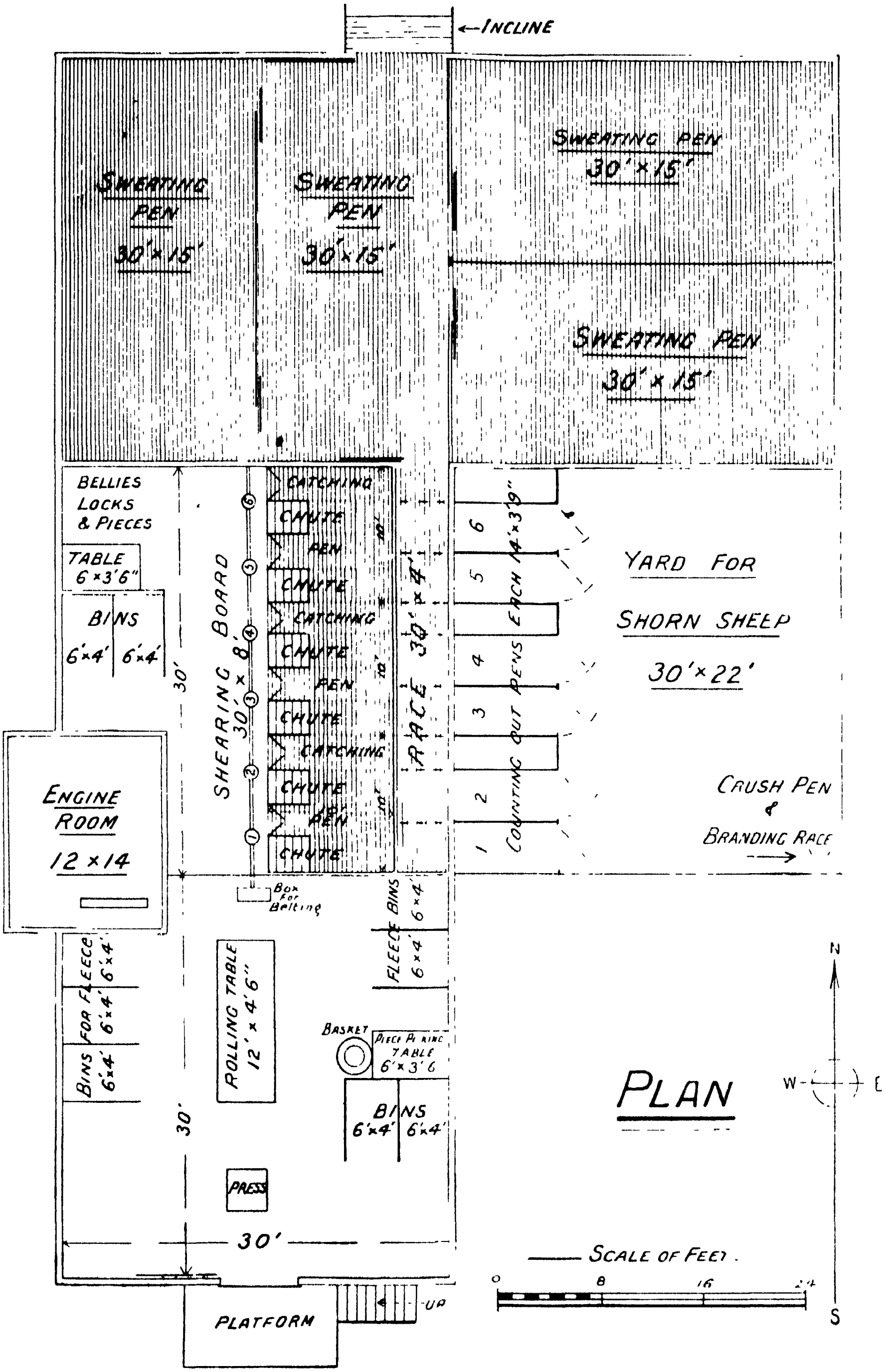
The Wool Room.

The wool-room arrangements, if they be good, considerably help the wool-classer, and to the same extent oppose the necessary preparation of the clip for market if they be bad. There is a certain relation between the positions of the various departments, such as the rolling tables and the piece-picking tables; the classing table and the fleece bins; the wool-press and all the bins.

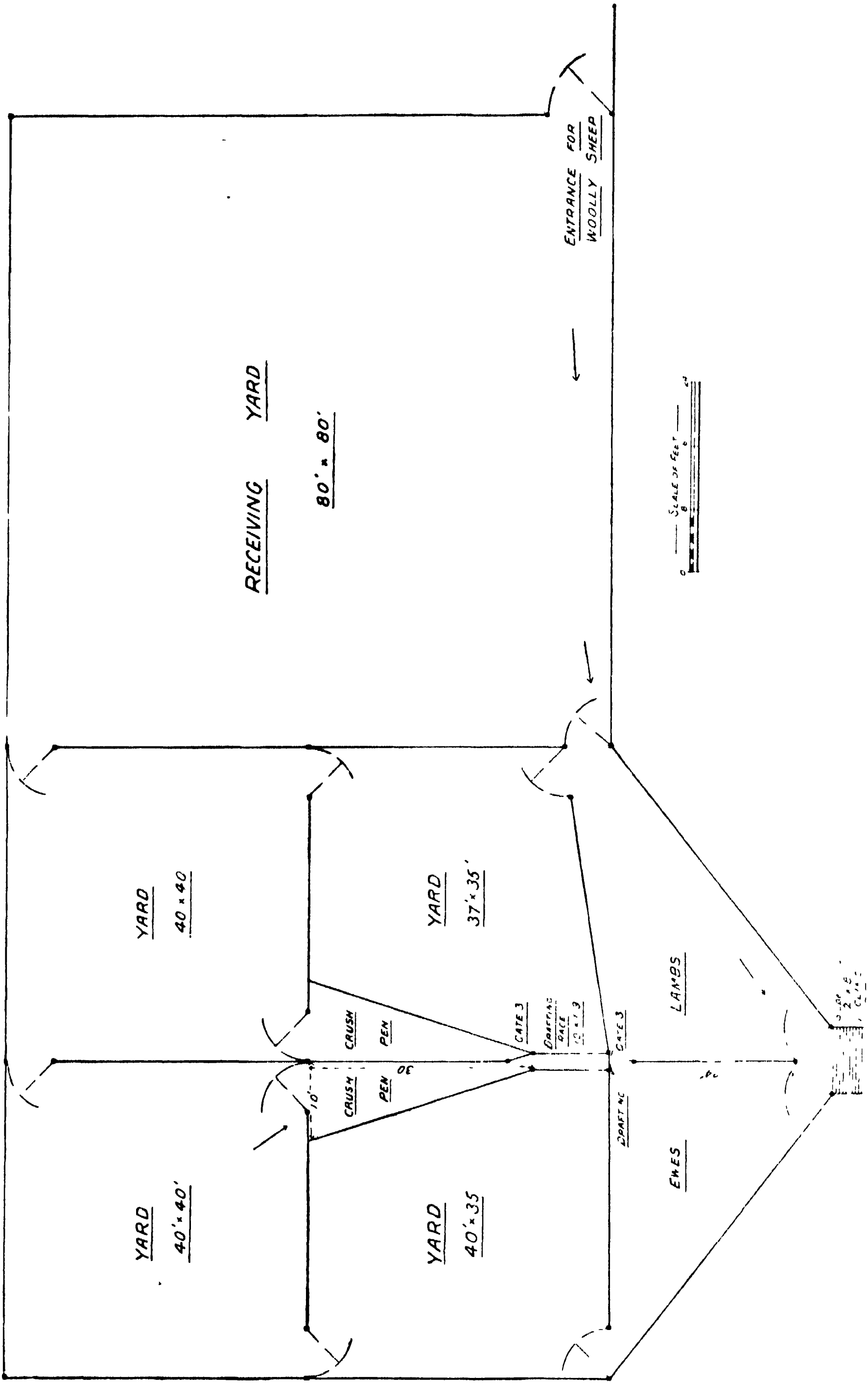
In a big shed for sixty shearers, the different shed departments would be spread over a large area, consequently men are necessary to carry fleeces to *and* from the classing table, while other men carry pieces to *or* from piece-pickers. In a small shed, the proportional number of shed hands to shearers diminishes, because less sorts are made, and these extra fleece and piece carriers are not required. The number of shearers in a shed is not always an absolute guide as to the actual number of shed hands required. There are points in the interior construction and arrangement which save labour. The number of sheep shorn per diem is a better guide; but then, again, the amount of wool skirted from the fleeces determines the amount of work to be done by piece-pickers.

The wool should come from the board to the rolling tables; thence to the piece-picking or classing tables, the bins, press, scales, and loading platform; so that the system prevents covering the same ground twice.

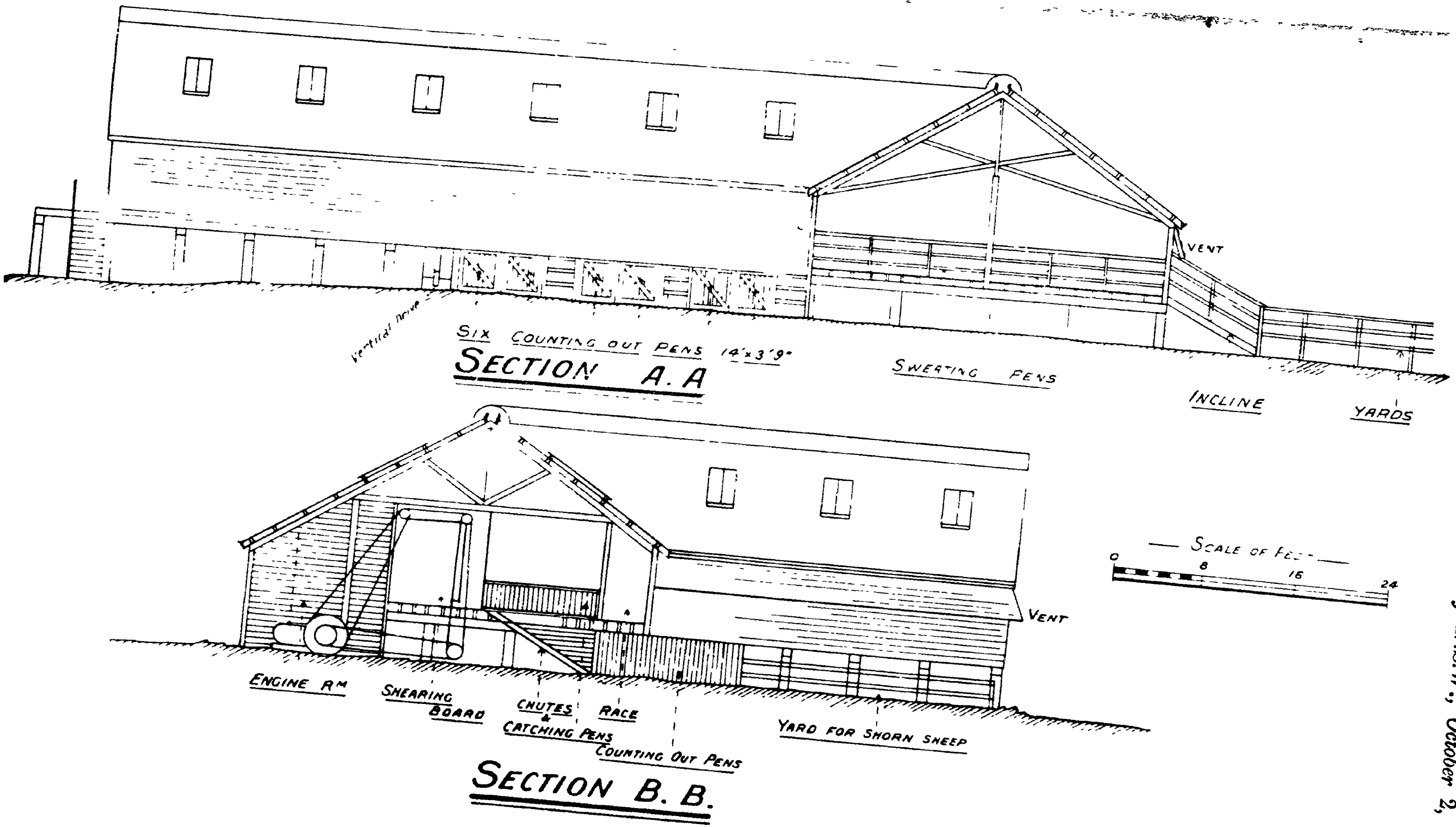
A good example of correct wool-room arrangement can be seen at Urangeline. During the writer's time, there were sixty shearers employed, and six rolling tables placed in a line were kept busy in the wool-room. The neck piece-picking tables and the breech tables are nearest the ends of the rolling tables from which these pieces are skirted off. The belly and lock tables are near



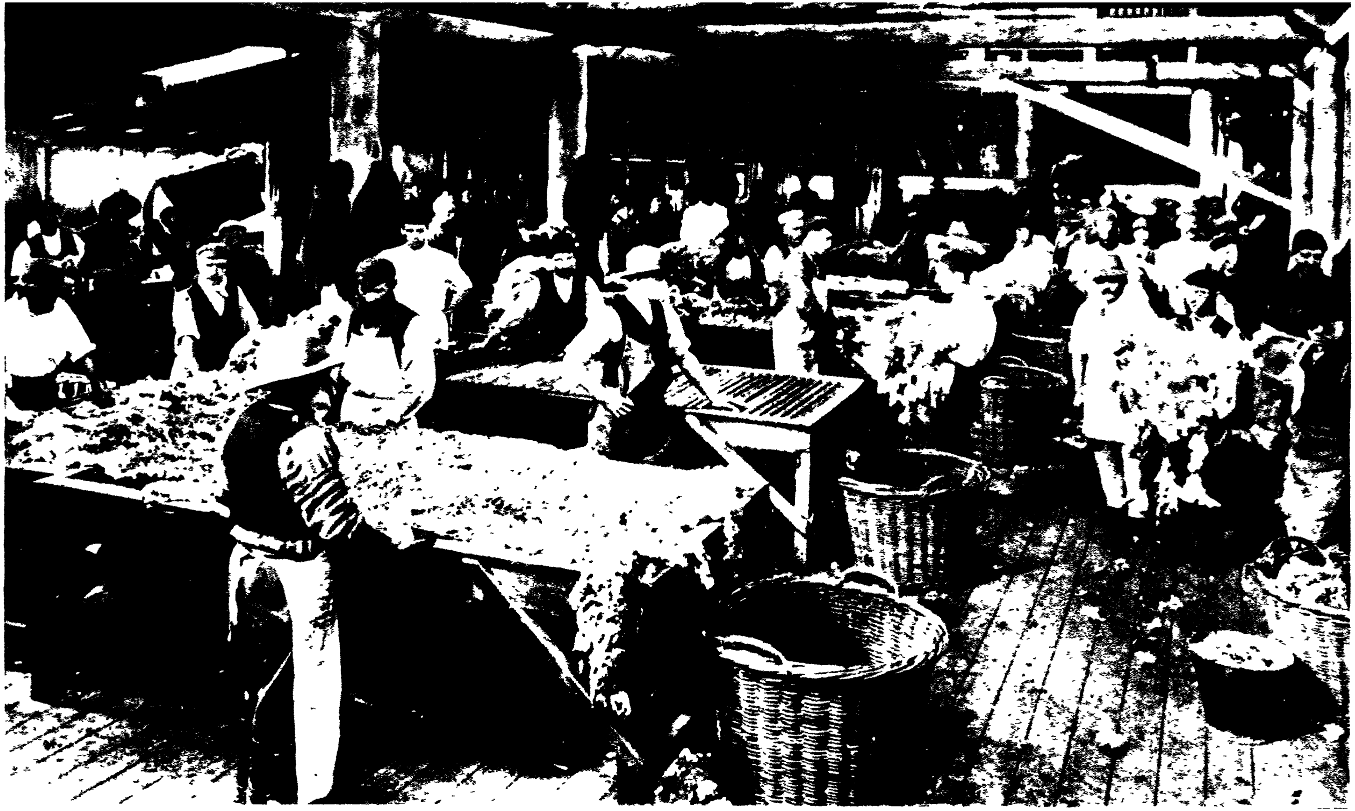
Plan of Small Shearing Shed.



Plan of Yards, &c., for Small Shearing Shed.



Elevation of Small Shearing Shed



Wool Room. Urangeline Station, Lockhart, N.S.W.

Showing position of Rolling Tables. Photo. taken from the Classing Table The wool-classer has a complete view of all wool-rollers and piece-pickers.

the board. Every piece-picker has separate bins into which he throws his different lots, so that the quality and quantity of each man's work can be inspected. The picked pieces are carried away and deposited in large bins near the wool press. The classing table is at one end of the line of rolling tables, and the wool press is only 7 or 8 feet away; consequently the classer can not only see every bale pressed, but he can observe the whole of the wool-room shed hands at work in front of him.

The Rolling Table.

Many of the rolling tables now in use were originally designed to meet the requirements of what are now called "pocket-handkerchief fleeces." There has been a wonderful increase in the size of fleece, and no present-day rolling table should be less than 11 feet long and 4 feet 6 inches wide. The wool-roller should be well over his work, and a table 2 feet 10 inches in height is about right.

For six shearers, one rolling table is enough, but an extra long one is very useful. The pieces skirted are not thrown to the ground, and in the event of two or three fleeces coming up quickly, they can be skirted, rolled, and left undisturbed at the one end of the table.

There is no need for a classing table. In this case the classer officiates as one wool-roller, and shares with the other roller the carrying away of the fleeces to the bins on either side; while one man is walking to a bin, the other gathers the pieces and throws them into the basket alongside the piece-picking table.

It is more difficult to pick-up and throw comparatively heavy, greasy, Merino fleeces than cross-bred fleeces. The latter lend themselves to quicker skirting, as they spread out on the table better and do not require so much straightening out. Two wool rollers can manage 800 cross-bred fleeces per diem, but 600 Merino fleeces would keep them as fully occupied.

Battens on the rolling table are preferable to rollers, which often get out of order, and practically become fixtures. The battens should form V-shaped slots, the lowest and narrowest point of the slot being from ¾ to ⅝ of an inch wide. There should be a fair depth, say 1½ inches, which will prevent fleeces again coming into contact with and picking up the previous second cuts and fribs which may not have worked through. The base of each batten is about 1½ inches, and the top ½ an inch wide.

The battens are not screwed or nailed down, but rest in slots along both sides of the rolling table, and are held firmly in position by two boards, 3 inches x 1 inch, which are screwed down tightly along both sides of the table.

The second cuts and fribs which fall through the rolling table are caught in a sheet made of bags cut down and sewn together. The sheet so formed is tacked up on the inner of one side of the table, but looped up with cord on the other side, and about 1 foot of sag is allowed in the middle.

Piece-picking Tables.

These are sloping slightly from 3 feet 3 inches (the highest part) to 3 feet or 2 feet 10 inches next to the piece-picker. Plenty of room is necessary; the main thing in picking pieces is to place only a little wool on the table at the one time.

In the plan, provision is made for a table near the shearing board, where locks, bellies and stains can be picked over alternately as they accumulate. In a day's shearing with six shearers this wool would not amount to more than three bales altogether, and it is more convenient to have these sorts picked near the board, where they can also be stored up, than picked in the wool-room.

If locks and stains are not picked over during the course of shearing, but are held over for wet weather delays, the stains should first be dried, as they will not then heat, and no wet matter will injure and stain clean wool which might be attached.

The tables are fitted with battens similar to the rolling table, and also with bag sheets underneath. Locks are more easily picked on a boarded-top table than a batten one, over which a hessian sheet has been spread. The tables here represented are 6 feet by 3 feet 6 inches wide. All tables should be movable.

The Bins.

The piece-picking bins are boarded up at one end to about 9 inches above the level of the back edge of the piece-picking table. From the other open ends the pieces are taken out for pressing, and the piece-picker is not disturbed.

In some sheds the bins for fleeces and pieces extend right across the wool-room in a straight line, and the press is in the rear, so that all the wool is put in one way and taken out from behind. It does not matter with pieces, but it is a very bad arrangement for fleece bins. The fleeces cannot be stacked, and must, consequently, be "goose-necked" in order that they hold together when thrown in. This fastening of each fleece takes time, and is extra work, and much better use can be made of available moments by paying extra attention to the skirting and correct rolling of the fleeces. Fleeces should be stacked carefully and tightly in rows, and be taken from the bins the same way as they were put in.

There is a little knack in stacking untied fleeces so that their elasticity and tendency to unroll keeps them tightly together. They can then be handled and put into the press in threes and fours without being broken.

In the plan there are five bins set apart for fleeces, and four for pieces. In classing a big cross-bred clip more fleece bins are required than for Merinos.

The Press.

In any shed the press should be near the classing table (in this case the rolling table), and in close proximity to the bins, the open ends of which point towards the press. There are many kinds of presses suitable for the small flock-owner, and costing from £15 to £20.

The Engine Room.

The small portable engine is indispensable on the farm or station. The engine-room should be as far away as possible from where the sheep enter the yards and sweating pens.

The room here illustrated is 14 feet by 12 feet. It is on the ground level, and a small flight of steps is necessary to connect it with the board. There is plenty of room here for the necessary fittings for grinding, and a small pigeon-hole rack for combs and cutters can be placed just inside the engine-room at the top of the steps. The roof of the engine-room is merely an extension of about 4 feet of the main roof at that part, and on the same angle.

There are two methods of driving the shafting—either an overhead arrangement, or, if there be sufficient elevation, a vertical drive. Both systems are shown in Plan B.B. The latter connection is in use on Welton Vale Station, Deepwater, the property of Mr. Robertson. Much of the vibration is overcome, as the short shafting and wheel under the floor can be made very rigid by its attachment to posts sunk into the ground and braced together. The belt comes up through the floor near the end shearer, and, of course, is boxed round to a height of about 5 feet for safety. The box would occupy a vertical space of about 1 foot 3 inches by 9 inches. The vertical drive has a downward pull on the bearings, which is an advantage.

Cost of Building.

Assuming that the shed as designed is compact and no more spacious than is necessary to meet the requirements of up-to-date classing and shearing, the cost of its construction will greatly depend on the locality and the materials used. A man might save room by putting up a six-stand shed with half the sweating pen accommodation shown here; stands 4 feet apart; and only three or four bins in the wool-room; but he would lose money in the long run, and be labouring under disadvantages all the time. Putting sheep under the shed is a practice not to be recommended. Should it be done in emergency, straw should be liberally spread over the dry dusty ground.

Some Materials.

Plenty of light in a shed is essential. The best windows are those corrugated smoked glass lengths, which fit under the tin. They are fairly cheap, do not leak, and while they admit the light the sun's bright rays are shut out. There are other windows fitted into frames working on hinges.

In the yards, swing-gates will suffice. In the shed and between the different pens, lift-pulley gates are the best. They require vertical framework on which to run, but they can be conveniently worked, no matter how tightly sheep are penned. The necessary framework and pulley wheels and weights make them costly. The next best are the slide gates, which are much cheaper. They are grooved on the bottom edge, and run back on a hard, fixed, rounded piece of wood or short length of iron piping kept greased. These gates take up little room, and can also be worked with full pens.

Sheets of zinc nailed over a light framework make the best interior for wool bins, but again the best is the most costly. Smooth pine timber is in general use. Corrugated iron and hessian are good substitutes.

In conclusion, it may be mentioned that a wool shed is not a wool-sorting establishment, and piece-pickers are not wool-sorters. Wool is a very valuable commodity, and reasonable conveniences should be afforded the classer and his men, so that the clip may be well prepared for market, and classified according to the demands of the wool trade, as far as up-to-date shedwork permits.

THE DORSET HORN IN AMERICA.

THE Cornell University College of Agriculture, New York, has for eight years been using the College sheep flock for the production of "hothouse" lambs, or lambs born late in the fall or early in the winter, and marketed from December to March, when there is a strong demand in Boston, New York, and Washington for young lambs weighing about 35 lb. dressed. The flock is made up of several breeds and grades of ewes, and three pure-bred rams, Hampshire, South Down, and Dorset Horn, have been allowed to run with the flock. The ewes are turned to pasture about 15th May, and the rams with them. No particular method of getting the ewes to breed early has been followed.

The eight years' results (Bulletin 309) show that from the standpoint of earliness of production, the Dorset Horns, pure-bred and grades, top the list, followed by Rambouillets, Delaines, grade Cheviots and Shropshires. It was found necessary to slaughter the lambs at about 48 lb. live weight to get top prices, and 93·3 per cent of the lambs born from grade Dorsets reached this weight in time.

In all, 401 lambs have been raised, of which 261 have been sold as hothouse lambs. The average selling price has been $7·52, and the annual income per sheep has been $6, exclusive of wool. The lambs have been fattened on corn, bran, wheat middlings, oil meal, &c., in addition to the mother's milk.

SEED MAIZE.

IN Circular No. 95 of the Bureau of Plant Industry, United States Department of Agriculture, "The Seed-corn Situation," the following remarks occur:—

> Even in sections where the corn crop is not likely to be an entire failure it is advisable during good corn seasons to retain sufficient seed for two or three years' plantings. Careful tests have shown that seed that grew under favourable conditions is more productive than seed of exactly the same strain grown under unfavourable conditions. . . . If the corn is poor in quality because of an unusually dry or an unusually wet season, no seed should be saved, and that grown during a more normal season should be planted.

Horse-breaking at the Hawkesbury Agricultural College.

GEORGE COBB, Farm Foreman, and J. W. HADFIELD, Instructor in Agriculture.

In the handling and training of horses, as in the upbringing and education of children, a considerable diversity of opinion must necessarily exist as to the best means to adopt. The ideas of the parent or trainer, as the case may be, in conjunction with the individuality of the pupil, will be the governing factors in moulding the practice that will suit the case in hand. This point is fully appreciated in compiling these few notes, and the subject matter relates simply to the methods adopted here at the College, varying them of course when necessary, but working as near as practicable to those outlined. While the notes may be of value to some who have not had any practice in this direction, they may also be of interest to the more experienced, in affording a comparison with the methods which they at present adopt.

The First Handling.

Harness horses and draughts are usually broken in at 3 years old. A few weeks before they are actually wanted, they are run into one of the home paddocks, where they become accustomed to the noise and traffic of the farm. Thence they are drafted as they are wanted into the stock-yards situated close to the stables.

A crush is almost essential for catching the horse safely and conveniently. It should be 6 to 7 feet high, to frustrate any attempts on the part of the horse to rear over the top rail. Moreover, it should be made in such a way that there are no ledges protruding on the inside likely to be a source of danger. It is usually best for the rails to butt one up to another, and be bolted to the posts, round timber being preferred. The door leading out of the crush should be solid, as this prevents the horse from hurting itself in pawing, and as he is unable to see in front, it keeps him very much quieter than he otherwise would be. After the horse has been run in, a couple of bars placed across and close up to the hind-quarters of the animal will effectually prevent him from backing, and, if well up, are not likely to cause any trouble if he is inclined to kick.

While in the crush approach the animal quietly, and slip on a good strong headstall (Fig. 1). Attach to this about 15 yards of rope 2½ inches in circumference. It should be attached by a bowline, as this is easily undone and will never jam, no matter what strain it receives.

The door is then opened and the horse let out for the first " lunge " (Fig. 2). This is often pretty vigorous, but no sudden and heavy strain should be put on the rope, otherwise the animal is likely to rear over, and possibly hurt himself. The horse is now lunged around the yard. It will need one or even two men in the middle, holding the rope, and keeping a gentle strain on it, thus forcing the horse to perform a circle. Another following the horse around with a whip, or a bag on the end of a stick, will keep him in constant motion. A bag is usually enough to keep him moving, and in any case the whip is not used in real earnest, but only laid gently across his back as occasion demands.

There exists, not only in the method, but also in the time taken, considerable difference between the treatment of draughts and light-harness horses. The former will be dealt with first, leaving the light-harness horses till later.

Draught Horses.

When dealing with draught horses then, this lunging is continued for the rest of the morning, and during the dinner-hour the horse can be tied securely to the fence in the yard. By the afternoon most of the dash should have disappeared, and he can be led out into the open, where he will become accustomed to other surroundings, and will be taught that here too he is still under the command of the rope. Every precaution should be taken to prevent him breaking away, and to commence with, it may take three or more men to check any attempt to do so.

By the end of the afternoon the animal should be under control, and fairly tractable. Exceptional cases do crop up, but they are rare, and a second day of lunging will generally bring them round. During the afternoon's lunging, the animal should be taught to lead, and towards the latter part of the afternoon can probably be handled and rubbed down a little. This ends the first day's work, and the horse, with his headstall on, is turned out into a convenient yard.

The morning of the second day is usually spent in further lunging. During the afternoon the bit may be placed in the mouth and left there. It is a light day's work, but is really a preparation for the following one, by getting the animal accustomed to the bit. It is usual to take it out at night, though in very exceptional cases it can be left in.

The third day, commence by gently lunging from the bit (Fig. 3). Two long and strong plough reins are attached, one to each ring in the bit. In some cases one man can manage both reins, but it is usual for two men to take one rein each, and lunge him both to the left and to the right, getting him accustomed to answer both to the near and to the off sides. This should be done without straining unduly on the mouth. The first use of the bit will naturally chafe the corners of the mouth, which, if in excess, is likely to make the animal hard in the mouth when broken in. In this way, the animal is driven anywhere around the farm. During the afternoon he is usually tractable enough, and if this is the case the tail is pulled (Fig. 4), the horse handled all over, and possibly harnessed up. This is, however, usually postponed to the following day, unless the horse is exceptionally quiet. He is run out in a yard during the night, with a headstall on.

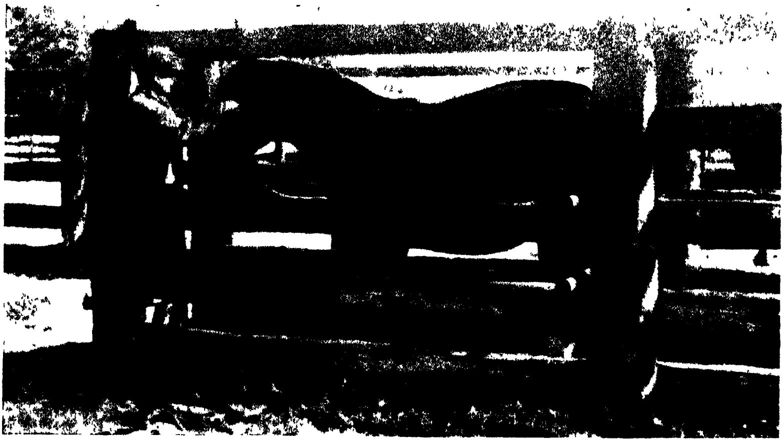


Fig. 1.—Putting on the Headstall.

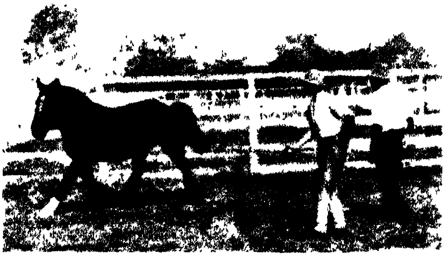


Fig. 2.—Lunging.
The first step in Horse-breaking.

Fig. 3 —Lunging from the bit,
which should take place about the third day

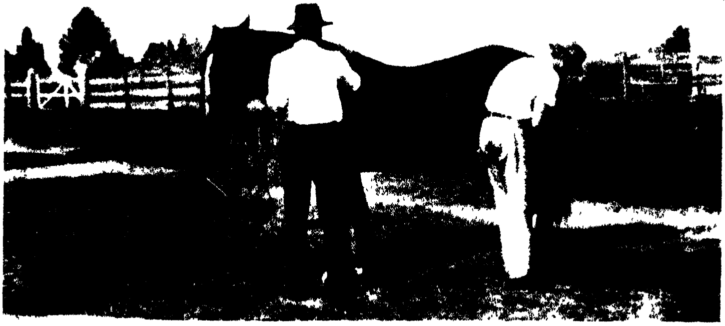


Fig. 4.—Tail pulling, and general handling towards the end of the third day

HORSE-BREAKING AT THE HAWKESBURY AGRICULTURAL COLLEGE.

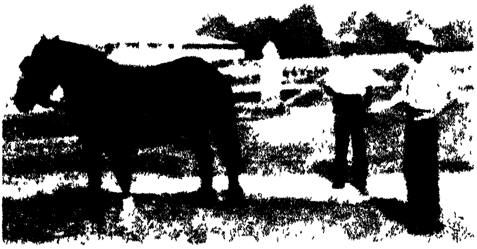


Fig. 5.—In harness for the first time, about the forenoon of the fourth day

Fig 6.—
Driving out to the plough team.

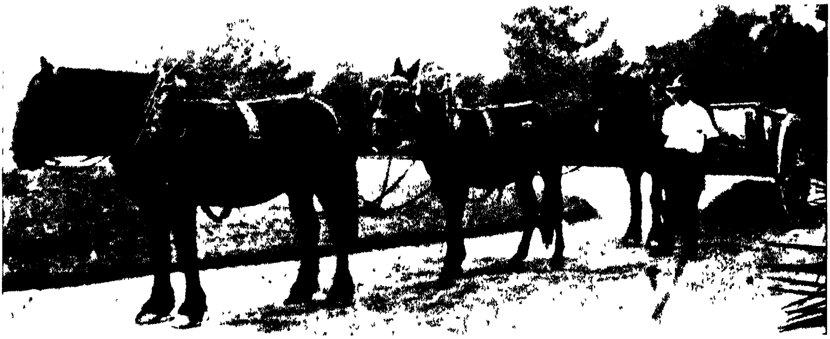


Fig. 7 - Breaking-in a mule in the "body" of a dray

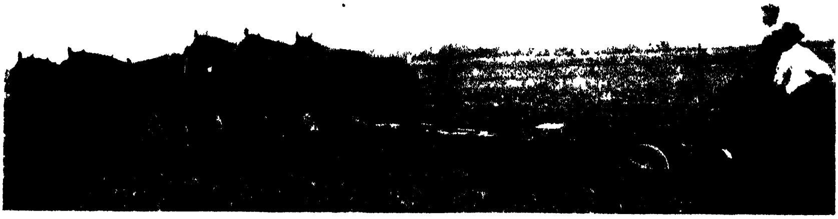


Fig. 8.—Young draught horse ploughing with a team in a four-furrow disc.

HORSE-BREAKING AT THE HAWKESBURY AGRICULTURAL COLLEGE.

On the following day, if everything has so far been successful, the horse is harnessed up in plough harness, and driven about during the morning (Fig. 5). By this time he should be sufficiently under control of the reins to necessitate only one man driving, but as a precaution, it is just as well sometimes to have a second man holding a third rein, in case of emergency. This is usually accomplished about the forenoon of the fourth day, when the horse can be given a little work. He is either placed in the body of a dray (Fig. 7), or in a large plough team (Fig. 8). Either one or the other is adopted here according to circumstances. If the horse is at all fractious the body of a dray is usually preferred, as the leader and shaft horses walk along regardless of the attempts of the young horse to play up. If to be put in a plough team, the horse is driven out to the paddock (Fig. 6), where the team is at work, and the near rear horse of the team taken out. The young horse is coupled up in this position, with the rope of the headstall attached to the spreader of the horse in front (Fig. 9).

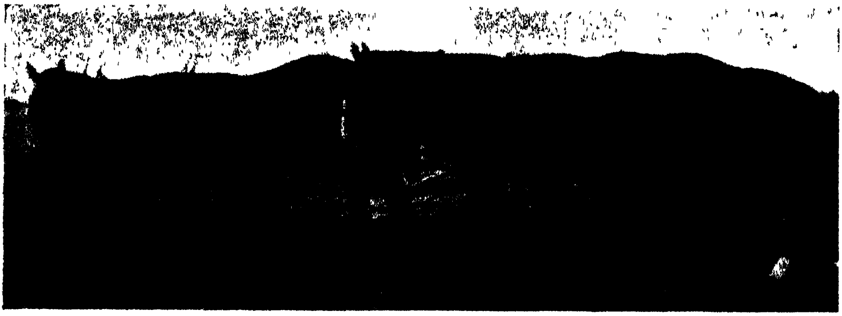


Fig. 9.—Showing position of young horse, and the method of tying-up to the spreader bar in front.

A round or two is as much as he can stand at a time, and not more than two or three solid hours' work is given per day, for the first three or four days. By this time the shoulders should be getting accustomed to the collar, and the time of working is gradually increased, but should never exceed half a day for three weeks or more.

It matters little what work they get, so long as it is straightforward going, and not infrequently harrowing is found convenient and effective. Carting is very much easier work than ploughing, especially if the distance is short, and the horses have long to stand while the dray is being loaded. The time will have to be regulated according to the work, but after the first day or so, they should easily stand half a day's carting. It all amounts to the fact that the individuality of the horse is the only sure guide to the amount of work he can stand. The work should be brought on him gradually, and it should be three or four months before he is put to full work. The hoofs will require trimming, and this can be done as soon as the animal is quiet enough. A good plan is to trim them after a spell of work, when he is tired and less inclined to kick, and it can usually be accomplished a few days after commencing work.

Light Harness Horses.

Dealing with light harness horses necessitates more care and time than with the draughts. Their training must necessarily be more thorough in every way, since their responsibilities are so much greater.

The procedure on the first day is the same as for the heavier horses. During the second day, more lunging will be necessary, possibly both morning and afternoon, but under normal conditions, after a little handling, a bit is put in his mouth, and he is turned out in a yard for the rest of the day. It is usual to take the bit out at night, and only under exceptional circumstances should it be allowed to remain overnight.

The third day commences the mouthing proper. The corners of the mouth must be tender before much can be done, and usually the worst part of the business is got over by the use of the mouthing rein. To arrange this, a surcingle and crupper are put on the horse. A rein runs from bit to bit, though a loop in the top of the surcingle, and is fixed in such a way that it exerts a gentle pressure into the corners of the mouth (Fig. 10). As can be seen from the illustration, there are buckles on the surcingle, to which the reins may be attached, but in practice here they are rarely used, as there is greater danger of mouthing one side more than another than when the rein can run freely through a loop as illustrated.

Fig. 10.—Using a mouthing rein on a light harness horse, usually about the third day.

The period of time to be taken up with this mouthing will depend altogether on the temperament of the animal. Usually a couple of days will suffice, giving the animal reasonable spells during the day, and letting him free for the night. This will take up most of the third and fourth days, and when thought sufficiently mouthed, an attempt is made to drive from the reins.

Long plough-reins are best to use, and the animal is driven by two drivers, in the same way as the draughts in their third day. When he will answer readily to the reins he can be harnessed up in spring-cart or sulky harness and driven about in this way, getting him used to the different parts of the harness. The reins should not be put through the terrets of the saddle, or saddle pads as the case may be. Young horses will often whip back, almost facing the driver, and such an arrangement will not allow him the same control as if they came away from the bit straight to his hands. Later, to get him used to the pressure of the collar, the traces can be lengthened with rope, and while one man hangs on to these, another drives, since the animal should be tractable enough by now for one driver (Fig. 11).

Fig. 11.—Getting used to the pressure of the collar, about five days after being first handled.

Moderately gentle but constant strain is required on the traces, since if the man hangs back too hard, the intermittent strain resulting from his being pulled off his feet occasionally, gives the horse a false impression of a load.

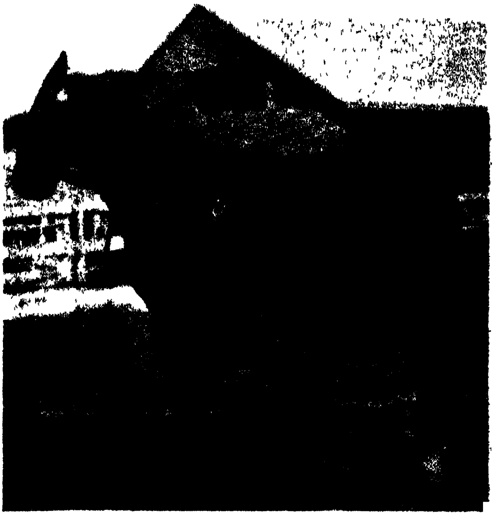


Fig. 12.—A plan for exerting pressure on the breeching.

The breeching can be made fairly tight, and this will accustom the horse to its presence, but another good plan is to take the breeching straps off, and attach plough reins in their place, one on each side, running them up through the hames and back again as shown in Fig. 12. Pressure can then be applied at will, by pulling on these two ropes, and one man can usually manage both the rope from the breeching and that from the traces. The unfamiliarity of young horses with the pressure of the breeching is often the cause of their kicking, especially in going down hill, when the momentum of the trap puts considerable strain on this part of the harness.

During the next couple of days this same process can be repeated five or six times, and may be continued still further till the horse takes kindly to the harness, when he may be made to pull a moderate load. The plan adopted here, is to harness the horse to a slide, and drive about on the grass (Fig. 13). The breeching straps are attached to the shaft tugs, the traces lengthened with a rope, and attached to a light swinglebar. The harness shown in the illustration is that used here, but the breeching need not be taken off, and ordinary sulky harness is just as efficient. Quite commonly they are put straight into a breaking-in sulky. The sledge gives only limited control over the horse, and the driver has to be pretty sure of his ground before he attempts this step. Harness horses of the heavier type are usually put in slow team work before doing any fast work.

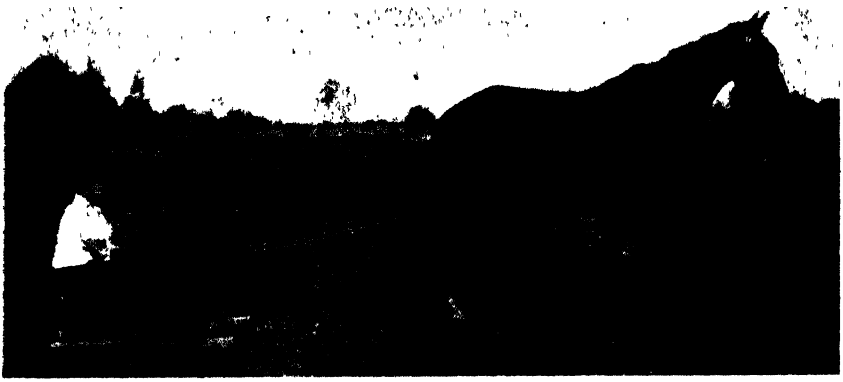


Fig. 13.—Harnessed up to a slide, previous to being put in a sulky.

If the slide is used, this preliminary training is continued on and off for three or four days, during which period the feet are trimmed and shod. The horse should now be quiet and tractable enough to put in a sulky, with no fear of his playing up. The sulky selected should be fairly light, and preferably have long shafts. A kicking strap is invariably used to check any attempts on the part of the horse to kick. He should be driven about on a quiet road, giving the greatest attention to his stride and paces generally. This undoubtedly is one of the most important parts of his training, and no one should handle the reins who does not thoroughly understand driving.

Throughout the working of young stock, both in the earlier and later stages, every attention should be paid to the collar. It is hardly necessary

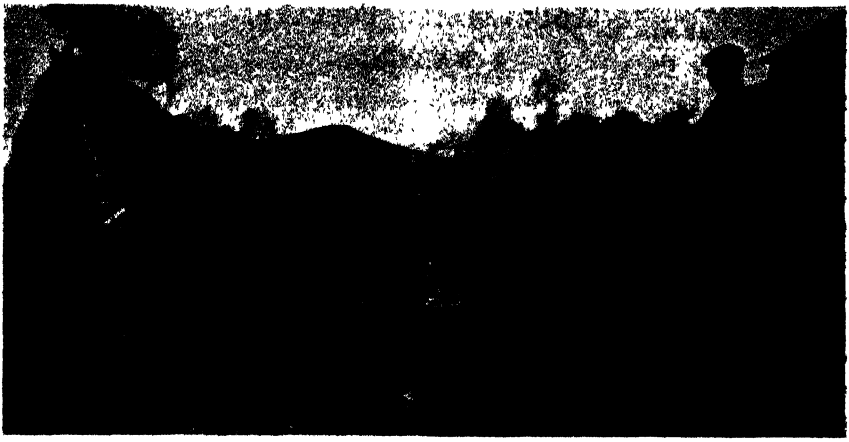


Fig. 14.—The final training. Note the long shafts and kicking strap.

to say that it must be a good fit, but it must be also looked to that the shoulders do not chafe, and the work modified, or the animal spelled, and the sore attended to, according to the extent of the chafe. Chafing is more likely to take place in hot weather, and as a preventive the shoulders should be bathed with salt water, and the sweat washed off the collar, which should be kept pliable with harness oil. Chafing may take place from the top of the collar fitting too tightly, and when putting it on care should be taken to draw the mane clear.

While the foregoing covers the methods adopted here at the College, and fits in with the conditions under which we work, it is hardly necessary to repeat that under varying conditions, these methods will have to be modified.

On many small farms, for instance, the foal will run with the mother while on a variety of jobs. It will thus become accustomed to the jangling of chains, and the general environment under which he, at a later stage, will also have to work. At times he is possibly hand-fed, and receives such handling as will do away with the necessity of much of the preliminary training that is found necessary here when they are not handled as foals. The catching and handling of foals is an excellent plan, though it is not advisable to make pets of them. They can be caught while at foot, or at weaning time, and made accustomed to being led and tied up with a halter. The result is that, more often than not, as a two-year-old, and after a day or two in harness, he is given a little work. Unless too light, he is probably put in a harrow team, larger teams not being available. Light harness horses that have received such handling, are often put straight into a sulky, while a common practice with many, after a little preliminary driving, is to lend them to some reliable coach proprietor, especially if the owner has not sufficient work to keep them quiet.

ADULTERATED POLLARD.

A WARNING.

SEVERAL samples of pollard have been recently submitted to the Department by purchasers, with a complaint that the produce has killed poultry or pigs. One sample sent by a poultry-keeper in the County of Cumberland contained as much as 33 per cent. of common salt, and caused the death of several fowls. Another sample, which was sent in by one of the Stock Inspectors, had killed several pigs. This sample contained about 18 per cent. of common salt.

In samples adulterated to this extent, the crystals of salt are generally discernible; but in smaller quantities, analysis would be necessary. And in any case, if suspicious crystals are found in pollard, samples should be sent to the Department of Agriculture for examination.

MILK TAINTED BY WEEDS.

IN the North-western portion of the State, milk is often badly tainted by cows feeding on such weeds as carrot-weed and wild mustard. If the milk or cream, immediately after separation, be heated to about 170 degrees Fahrenheit, and rapidly cooled afterwards, a great deal of the odour of these weeds will be driven off. A little sour cream should be held over to add to the cream after cooling, so as to ripen it. If the butter is only required for home use, the addition of a small quantity of saltpetre to the cream, immediately after separation, will also have a useful effect; but the buttermilk made therefrom should not be given to calves, though it may be given to pigs. Half a teaspoonful of saltpetre to 5 gallons of cream will be sufficient.—M. A. O'CALLAGHAN.

EEL-WORMS DESTROYING TOMATO PLANTS.

A NURSERYMAN recently submitted specimens of tomato seedlings which wither at the roots just as the second leaves appear. He had tried several sprays, but could not save them.

The Bureau of Microbiology found eel-worms (*Heterodera*) in the base of the stem and in the roots. The best plan would be to clean out the boxes or obtain new ones, and fill with fresh soil from a clean place; or the soil should be treated to kill the worms. Saturating with formalin, about 1 in 200, or carbolic, 1 in 20, is useful It is best to apply any such remedy about three times, ten days to a fortnight between each, as the eggs hatch out in about ten days. The first application kills the adults, and the second the young that have hatched. Baking the soil to at least 160 degrees Fahrenheit will also destroy the worms and eggs.

Osteo-malacia in Cattle in New South Wales.

MAX HENRY, M.R.C.V.S., B.V.Sc., Government Veterinary Surgeon.

DURING the past few years many farmers in the coastal districts have written to the Department asking for information and help in connection with a disease of cattle, which, in many cases, had only freshly made its appearance amongst their stock, although in other cases it had been noticed for some time past. The disease had received various names, such as "Stiffs," "Coast Disease," "Bone-chewing," "Rickets," &c., but the symptoms given pointed to the fact that all these names were applied to one and the same disease.

As it appeared that the loss to dairymen and graziers on coastal areas must be considerable as a result of the ravages of this disease, it was thought desirable that an investigation into the cause and possible treatment should be carried out. From previous observations it had been noted that the disease appeared to be more or less coincident with a certain class of country and soil, and an investigation was therefore commenced along these lines.

Locality.

Inquiry showed that the disease was widely distributed throughout the coastal areas, being particularly noticeable in the Pastures Protection Districts of Grafton, Port Macquarie, Sydney, Nepean, Broulee and Eden, and less so in other coastal districts, and that in each of these districts there were certain areas in which the disease caused heavy loss. These areas were often sharply marked off from the surrounding country, in which practically no loss was sustained. This is particularly noticeable with certain affected areas in the Eden Pastures Protection District. It has been reported from certain inland districts, but, on the whole, must be regarded as a coastal disease.

Quite recently many inquiries in connection with this disease have been received from settlers on the newly opened up Dorrigo lands, and the fact that this affection is evidently present in those areas to a considerable extent, and as they are more widely utilised is likely to be more often brought under our notice, has influenced the publication of this note, which was prepared some eighteen months ago. It is felt that farmers taking up land there should be in a position to recognise the disease and be able to take remedial steps at once before the mischief is too far advanced. Moreover, when reading a paper before the Veterinary Association of New South Wales on the disease as found in Queensland, Dr. Dodd, F.R.C.V.S., D.V.Sc., expressed the opinion that under present conditions of farming, when rather poor land is continually being grazed, and no return in the shape of fertilisers and manures is given, the affection will tend to become still more noticeable, and will cause heavier loss. This opinion was corroborated by the writer from experience gained on the South Coast, where the disease would appear to be increasing in severity, and where it is responsible for rumours of sudden and inexplicable loss amongst cattle.

Nature and Symptoms.

The disease referred to is a form of Osteo-malacia, or " bone-softening," to a certain extent corresponding in the adult, and due to much the same cause, as Rachitis, or " Rickets," properly so-called in the young. It must not be confused with another coast disease—Zamia or Burrawang Poisoning —which is also often wrongly referred to as Rickets.

The various names given to this affection are all indicative of one or other of the symptoms commonly shown. Cattle, when affected, show a stiffness in the hind-quarters, which may develop into actual lameness. In some instances there is more or less swelling of the joints, particularly of the fetlocks; the hind limbs are more commonly affected than the fore limbs; the back is arched, and the beast has, after a while, a general unthrifty, poor appearance; the coat is harsh and dry, and the eye somewhat dull. The appetite, although fair, is perverted, and the cattle are continually chewing hard substances, especially bones, but tins, sticks, shells and other objects are also picked up. In many instances these foreign bodies become fixed between the teeth and the cheek. or the floor and roof of the mouth, and cause trouble. The bones, especially the ribs and limb bones, break easily, and it is not uncommon to find four or five ribs broken on *post-mortem*. In the case of milking cows, the milk yield decreases, and the calves born of such stock are likely to be stunted and ill-nourished. The disease is most prevalent in the spring and autumn, and affects milking cows more severely than dry stock.

Post-mortem Appearances.

On *post-mortem* examination, all the internal viscera are found to be in a normal condition, although there is in some cases a more or less marked impaction of the omasum. This must be looked upon as secondary to the Osteo-malacia, and is probably due to deficient tone of the digestive organs, resulting from general debility. It is not a constant symptom. The bones of the limbs and the ribs will be found to be brittle and easily snapped. In other cases, the bones become rather soft than brittle, and can readily be cut with a knife. A few instances have been noted of bony enlargements on the lower extremities of the metacarpal and metatarsal bones, although, as a rule, there does not appear to be any abnormality of form.

Cause.

The cause is to be looked for primarily in soil poverty, or in a deficiency of certain ingredients, more especially of lime and phosphates. These mineral constituents are most essential to the growth and nourishment of the animal body, and especially to the formation of bone, which is largely composed of phosphate of calcium (over 50 per cent.); and to the secretion of milk, the principal salts of which are calcium phosphate and salts of sodium and potassium. Calcium phosphate also enters largely into the composition of other portions of the body. This explains the fact that in-calf milking cattle suffer so severely, as there is the double drain on the system of the milk and the growing fœtus. It further explains the severity of the disease on young growing stock, which demand a much greater proportional amount of these salts than do adults. It has been suggested that the disease is of bacterial origin, but the close inter-relation of the affection with soil poverty militates against this view. Furthermore, the curative measures suggested below are recognised even where the bacterial theory is upheld, and it is difficult to understand wherein they harmonise with this view.

Treatment.

In many places it has been observed that cattle in the early stages of the disease, if moved from the affected country, rapidly recovered; that cows showing symptoms during lactation and pregnancy recovered on being dried off; and that feeding on bran and oil-cake exercised a highly beneficial effect. Such results are readily explained if we consider the cause as being essentially one of soil poverty.

The following curative measures are suggested :—

1. In the case of cows hand-fed, the addition of two or three tablespoonfuls of sterilised bone-meal to the feed daily will be found highly beneficial.
2. Cows and other cattle not hand-fed should be provided with a lick composed of salt, 40 parts; sulphate of iron, 1 part; and bone-meal, 10 to 20 parts. The bone-meal should first be mixed in a small proportion, as the cattle may not at once take to it, although, if they are noted bone-chewers, there will be little difficulty. It may be later increased to equal parts or more with the salt. If desired, and the cattle will take it, the bone-meal may be given alone, as it is, of course, the essential part of the lick. The addition of a little molasses will add to the palatability of the mixture, and increase its nutritive properties.
3. The addition of bran or oil-cake ration to the feed of hand-fed cattle will be found useful.
4. Manuring and improving of pastures must, of course, lead to enrichment both of soil and herbage, and so check the ravages of the disease; and the use of superphosphate and bone-dust, and the liming of pastures would all be found helpful, especially on small holdings of fairly good country. With the large grazing areas of poor country, it is, of course, impracticable.

The experience of one farmer may be quoted. He wrote requesting assistance, as his cattle were suffering from "Bone-chewing," with lameness and increasing poverty. He was advised to carry out the treatment recommended above. Two months later he was able to report that all his cattle had recovered except one cow, and that she was progressing satisfactorily. She had been very bad at the start, having three or four ribs broken.

Good results have been obtained on farms in Central Cumberland by giving the lick as described above alone, the lick being placed in small boxes and protected from the wet.

South African and Queensland experience bears out the good results of the treatment here outlined.

NOTE ON *Opuntia aurantiaca* (PRICKLY PEAR).

Previous reference, with figure, this *Gazette*, April, 1911, page 321.

South Africa is cursed with this particular species to a very much greater extent than we are in New South Wales and Queensland. It is known in that country as Jointed Cactus, or Jointed Prickly Cactus, and is usually referred to as a vile pest, separate from the larger jointed species, which go under the name of Prickly Pear.

I need hardly say it is a true Prickly Pear or Opuntia, and I reiterate that it is one of the worst of all species. There are many references to it in Cape literature, particularly the *Agricultural Journal of the Cape of Good Hope*. It is only recently that it has extended from the Cape of Good Hope to the Orange Free State and the Transvaal. Two papers giving the South African view of it will be found in the journal already quoted, vol. 29, page 812, and vol. 32, page 341. The latter paper gives an account of various chemical preparations used for fighting it.

In South Africa it is referred to as *Opuntia pusilla*, Haw.; but through the kindness of Professor H. H. W. Pearson, of Capetown, I recently received specimens which show it to be *Opuntia aurantiaca*, which is already firmly established in our own State.

Now that we know that we have the same species to cope with, we shall the more intelligently follow the experience and efforts of our South African friends. A character of this plant is the brittleness of its small joints, which tenaciously adhere to the legs, hides and fleeces of animals, and are hence carried over long distances. Our own Pest Pear is not propagated much in that way, the joints being individually too large.

Where it appears in a new district, it can be readily dug up and destroyed, preferably by burning. The burying method can be adopted, but such a method places the farmer at the mercy of a careless servant, since the work may not be perfectly carried out.

It is idle to say that we cannot afford to destroy this pest; as a matter of fact we cannot afford not to destroy it. So far as my experience goes, it is only found in a few districts at present, and I believe a few hundreds of pounds, at the outside, would annihilate it, provided there be co-operation on the part of Queensland.—J. H. MAIDEN.

European Trade in Dairy Products.

EXPORTS FROM DENMARK INTO GERMANY.

C. PEDERSEN, Dairy Branch.

DENMARK has for years done a fair amount of direct trade with Germany in butter, and it is interesting to note the change which the trade has taken during later years from direct export of butter to a large direct export of milk and cream.

From the accompanying table it will be seen that in the year 1904-05 about 7,000,000 lb. of butter were exported in kiels, and the butter made from milk and cream imported from Denmark totalled 1,630,000 lb. in addition. The following year saw a big drop in the export of manufactured butter, and the milk and cream export rose to the equivalent of nearly 3,000,000 lb. of butter. The manufactured butter has had a steady rise since, but the unmanufactured in the way of milk and cream has made a much greater advance.

For some reason there was an enormous increase both in manufactured butter and cream imported from Denmark during 1908-09, and this increase was maintained the following year.

The cause of this milk and cream trade having sprung up is, that there is rather a heavy duty on the importation of butter into Germany, while milk and cream enter free. There are now several large butter-making establishments on the German side of the border, erected solely for the purpose of treating the raw material produced on the Danish side. The inducement held out to the Danish dairymen must be profitable when we take into consideration that all the milk and cream is first received at their own factory before being exported.

The milk and cream is paid for on its fat contents and quality, but the prices seem to vary considerably. Some factories receive about ½d. over Copenhagen top price for best grade butter, while others receive only equal to ⅛d. over top quotations. The buttermilk is, of course, kept by the manufacturers; it is mostly paid for by ⅛d. for every pound of butter made from the cream. The testing of the milk and cream is done by both suppliers and manufacturers, and, if there is a difference, the average of the tests is taken as the basis for paying.

In some instances the milk and cream are churned on the account of the supplying factories. In such cases the charge for manufacture, including packages (kiels), butter colour, salt, paper, and the payment of transport of the butter is only ½d. per lb. This seems rather a low charge, and, unless something can be made out of moisture, one fails to understand how the work can be done for such a small amount.

EXPORTS OF DAIRY PRODUCTS FROM DENMARK TO GERMANY.

Year.	Milk (Butter value).	Cream (Butter value).	Total Milk and Cream (Butter value).	Exported Butter in Kiels.	Total Export of Butter.
	lb.	lb.	lb.	lb.	lb.
1904-05	241,000	1,389,000	1,630,000	7,000,000	8,630,000
1905-06	423,000	4,039,000	4,462,000	1,700,000	6,126,000
1906-07	800,000	5,060,000	5,860,000	2,200,000	8,060,000
1907-08	1,004,000	4,519,046	5,523,046	4,200,000	9,725,000
1908-09	962,000	6,000,000	6,962,000	8,500,000	15,462,000
1909-10	600,000	9,800,000	10,400,000	4,700,000	15,100,000

The significance of these figures for Australian butter-makers is that there will be that much less left to compete with our butter on the English markets; and it is apparent from the great industrial development which is taking place in Germany, that year by year their import of butter from abroad must grow, and those in the best position to supply them are their nearest neighbours—a fact which makes the outlook for Australian butter on the English markets an improving one.

EXPORT OF GRAPES TO ENGLAND.

ACCORDING to advices received by the Minister of Agriculture from the Agent General for New South Wales, London, the trial shipment of Ohanez (Daria) grapes forwarded to London from Wagga Experiment Farm, per S.S. "Aeneas," in May last, arrived in a very unsatisfactory condition, while from observations taken it has been found that similar varieties of grapes, picked at the same time as the consignment in question, and placed in the packing house at the Wagga Experiment Farm, kept in good condition for about eight weeks.

The report states that the exported packages landed in a more or less wet condition, and on being opened the bulk showed a heavy proportion of waste, it being impossible to find a sound bunch of fruit in the whole consignment. The sound berries indicated that the grapes were of excellent quality, being of correct flavour and well tinted. The variety is considered the best that has been seen in London from New South Wales; also, it is stated that they should stand the journey from Sydney if cut and packed at the correct stage of maturity. It is recommended by the distributing agents in London that cases be packed with two trays instead of three as formerly. They point out that the weight, when bulked in three trays, is too heavy for dockers to carry about easily; consequently they "pitch" the cases, and by this means the fruit would be injured, however well it might be packed. The agents were unable to express an opinion on the general packing, owing to the poor condition of the grapes, but they stated that there is a possibility that the grapes were packed too tightly.

Mr. W. J. Allen, Fruit Expert of the Department of Agriculture, considers that the export of grapes will not be successful until a small chamber can be filled and a guarantee obtained that the fruit will be carried at an even temperature throughout the whole voyage.

Feeding Calves.

An inquiry was recently received from the Willesborough Estate, Kent, England, respecting the best substitutes for new milk in rearing calves by hand. Reports were obtained from the Hawkesbury Agricultural College and several Experiment Farms, and copies supplied. As the information may be of value to many dairy farmers in the State, it is repeated here.

HAWKESBURY AGRICULTURAL COLLEGE.

H. BARLOW, Dairy Instructor.

At present, and for the last nine months, only skim-milk is used as a basis. The milk is pasteurised at 180 degrees Fahr. for ten minutes and cooled to 100 degrees Fahr. before feeding. As a substitute for fat, we use a jelly made from either crushed or whole linseed (crushed linseed is preferable, as there is less waste).

The linseed is allowed to boil slowly (equal parts linseed and water) for about three hours, and the jelly is then fed to the calves in amounts varying from ¼ to ½ pint, according to the age of the calf.

In addition to the milk food, the calves are given roughage in the form of lucerne or oaten chaff, or a mixture of both. The chaff is put in a trough where all the calves can get it, and when they are about three weeks to a month old, they eat it readily, and it seems to overcome, to a certain extent, any tendency to scour.

WAGGA EXPERIMENT FARM.

W. G. A. LEE, Dairy Instructor.

The calf is left with its mother from twelve to twenty-four hours after birth, and is then placed in a pen under cover and bedded with straw. When the calf becomes hungry and ready to drink (twelve hours after leaving the cow) it is fed with new milk from its mother, fresh and warm, by means of a calf-feeder. For the first week its mother's milk is fed.

The calf receives full milk till three weeks old, at the rate of 5 to 6 lb. of milk twice daily. The whole milk is then gradually replaced with fresh skim-milk, till at the expiration of another fortnight the calf is receiving skim milk only. At this stage cocoanut oil-cake is added to the milk, using 1 lb. of cake to 100 lb. of milk. The cake is prepared by boiling in a gallon of milk till broken down.

As the calf increases in size, the quantities of skim-milk and oil-cake are increased, calves 3 to 4 months old receiving 2 gallons of milk and 2 per cent. of oil-cake per day.

The froth on the separated milk is taken away by pouring the milk into a vat with a tap at the bottom, when the milk can be drawn off without the froth.

In addition to milk food, the older calves are allowed mixed feed of wheaten chaff, bran, oats, or boiled barley twice daily after having their milk food, the average consumption being 2 oz. chaff, 3 oz. bran, and 3 oz. grain.

If grass is not available, silage and lucerne hay are provided. Rock salt, shade and water are always handy.

All calves over 3 weeks old are allowed to run in the open paddock during the day, and bedded down at night in a comfortable shed.

Weaning takes place at 6 months old, and if good grass is not available the growth and strength of the calf is maintained with chaff, bran, silage, grain, and lucerne hay.

GRAFTON EXPERIMENT FARM.

A. H. HAYWOOD, Manager.

After the third week the calf is on skim milk, to which is then added a substitute for the butter-fat. We are at present using molasses—about 3 oz. per calf to start with, and increased as the calf grows. Care is taken that the molasses is not given in excess, in which case it acts severely on the bowels. Cocoanut oil-cake and maize-meal have been used successfully.

Linseed, after the bolls have been knocked off by the peg-drum thresher, and fed in the dry form, after the calf has had its milk diet, seemed to give satisfactory results. Lucerne hay is always made available to the calf from the time it can assimilate it.

Sorghum and maize silage is fed most during winter and early spring months.

Indian cane is about the cheapest form of roughage for calves after they are about 3 or 4 months old. They fatten quickly on it.

WOLLONGBAR EXPERIMENT FARM.

JAS. SAINTY, Assistant Dairy Instructor.

Calves up to 3 weeks old receive whole milk, starting with colostrum, as is usual. To the sixth week they are gradually changed to skim-milk. As a substitute for fat, crushed linseed cake is used, up to ½ lb. per day being given, starting with 1 or 2 oz. The cake is boiled half an hour previous to being fed.

The ration of milk varies with the age and size of the calf—8 or 10 lb. at a week; 14 lb. at 3 weeks; 2 gallons at 2 months.

In the case of a shortage of pasture, silage mixed with half quantity of chaffed Indian cane (green) is given. To the above is added any linseed cake available, at the rate of ¼ lb. per calf.

Lucerne on the South Coast.

REPORT ON EXPERIMENT PLOTS.

R. N. MAKIN, Inspector of Agriculture.

DURING 1911, four plots of lucerne were sown as experiments, one at Moruya, in March; and one each at Bombala, Berry and Unanderra, during September. The Berry and Unanderra plots were outright failures; the Bombala one has done fairly well; whilst the Moruya plot has done exceptionally well, and is an object-lesson to the farmers of the district. On all the plots the seed was sown by hand broadcast, at the rate of 16 lb. per acre, and a portion of each plot was manured with a mixture recommended by the Department, at the rate of 2 cwt. per acre.

Moruya.

The Moruya plot was sown on 20th March, 1911, and came up very well. Soon afterwards, wild turnips made their appearance so thickly as to threaten to smother the young lucerne plants. In an effort to overcome this pest, and to give good root formation to the lucerne plants, I had thirty sheep put on the plot, the area of which is 1¼ acres. They ate the paddock bare. After a good fall of rain the lucerne and turnips started to grow again, and the turnips outstripped the lucerne so much that not a vestige of lucerne could be seen. I decided to let the turnips run up to blossom and then mow them. At the time of mowing the paddock presented a remarkable appearance, the turnips being a mass of yellow blossom. However, it was mown down, and the stuff carted off, and the lucerne, which many thought had disappeared, started to grow up, and has done so well that during last summer some five good cuttings were taken from the patch. On last inspection, 20th June, 1912, there was no evidence of any turnips or other troublesome weed. So far there has been no appreciable difference between the manured and unmanured plots.

The soil is typical of a fairly large area of country along the banks of the Moruya River, and farmers should not hesitate to put down good patches of lucerne on land similar to that of the plot. Another plot has recently been laid down at Moruya on a different class of soil, which will be reported on later.

Bombala.

The Bombala plot is on flat ground of black basaltic formation, typical of a large area of Monaro country. Many farmers around Bombala are under the impression that they must have flat ground to grow lucerne successfully, but my impression is that the gentle slopes of lighter soil is better adapted.

In the township of Bombala there are several small patches of lucerne doing remarkably well on soil where one would hesitate perhaps before sowing larger areas whilst better looking soil was available. One patch, for instance, belonging to Mr. Fred. Dawson, of about ¼ acre, is situated on a rise, and the soil has not the appearance of any great fertility, especially when one notices within a couple of chains distance a brickyard; yet the lucerne is doing remarkably well, and has been there for several years. Another good patch of lucerne of about ¼ acre is between one of the Banks and the School of Arts in Bombala, on apparently very poor soil, and yet this patch had one of the best crops of lucerne last season that I have yet seen.

These are object-lessons for the farmers of the district. Unfortunately, it seems that very little notice is taken of them. There is much land around Bombala that might be laid down profitably with lucerne, and it is to be hoped that the farmers and squatters will not miss an opportunity to try patches of land that do not appear first-class—that is providing the soil is well drained and the rocks are not too close to the surface.

Time to Sow.

For the failure of the Unanderra and Berry plots I blame the dry spring that followed sowing. Bombala, Berry and Unanderra plots were all sown in September. As regards the coast, I would strongly advise no further spring sowings, as records for a number of years from the different districts show, on the average, that the spring months are much the driest in the year. March sowing is much to be preferred.

PURE-BRED RAMS FOR SALE AT WAGGA EXPERIMENT FARM.

THE following rams are available for private sale at Wagga Experiment Farm:—

Breed.	2-tooths.	Aged.
Shropshire	6	3
South Down	2	2
Dorset Horn	4	5
English Leicester	5	4

Price, **£3 3s.** per head, on trucks at Bomen.

The Dorset Horn has proved a very suitable breed for the raising of five months' lambs, especially in the drier districts, and the Department would recommend breeders to obtain one or two rams of this breed for the purpose of giving them a trial and comparing them with other breeds which they may be using.

Applications should be addressed to "The Manager, Wagga Experiment Farm, Bomen."

The Cat Problem in Australia.

A. S. LE SOUEF, Director, Zoological Gardens, Sydney.

AUSTRALIA is having another wild animal added to its fauna from a rather unexpected quarter, in the form of our common house cat. Of course as long as our well beloved pussies consent to stay at home and play the part of animated mouse-traps, we have no fault to find with them, but when they throw off our authority and start an independent existence in the bush, it behoves us to look to their antecedents, and see if any special precautions are necessary under the new arrangement.

The origin of the common cat is fairly well known. It first appeared in Egypt, and was the result of the domestication of the wild caffir cat, a somewhat slender animal with a long tapering tail. These cats were in course of time introduced into England, and admixture occurred with the wild English cat, a much larger and heavier animal with a bushy tail and thick fur; and it is from this stock that the great majority of the cats in Australia have sprung. A few other varieties have been introduced, notably the long-haired Persian and the fawn-coloured Siamese, but these would not have any appreciable effect on the race.

Broadly speaking, we can say that our cats have been under domestication more or less for from one to two thousand years—a time all too short to essentially change their characteristics. Moreover, their hunting instincts have been kept alive by the encouragement they receive to catch mice and rats in our homes, so it is very natural that they should readily return to their wild state when opportunity offers, and as a matter of fact cats in the wild state are spreading all over Australia.

Most people have a prejudice against killing cats, but the surplus have to be got rid of, and in the country this is generally effected by turning them loose in the bush as far from home as possible, where they are left to shift for themselves. Others again have been turned out by stock-owners as a supposed enemy of the rabbit; while some, with the old hunting instinct more strongly developed, have wandered off into the wilds on their own. We now have to recognise that they have become established throughout the land, and are, of course, living on the wild game. Careful observation in the bush shows that they are not at all particular on what they feed—birds, small animals, lizards, opossums, and even lambs go to form the bill of fare, and, of course, the rabbit when they are in his locality. In Lord Howe Island, where they are very numerous, they are living on the sea-birds; and in this connection the experiences of the sealers at the Macquarie Islands are worth mentioning. At first rabbits were introduced to make a change of diet, but they became a nuisance by eating up the crops, &c., so cats were introduced to kill off the rabbits. This they soon did, but also killed the sea-birds which supplied the sealers with eggs; so dogs were brought along to kill off the cats. In due time this also was accomplished, but the dogs then attacked the seals, so the inhabitants had to turn to and kill off the dogs.

Although it is rather early to form definite conclusions, yet cats which have been for some generations in the wild state in Australia seem to be reverting to a specialised type—that of a blotched tabby, with a noticeable increase in size, this being especially marked in the Toms. In parts of Queensland they are more or less striped, and have a heavy ruff round the neck. In Lord Howe Island they are very dark, mottled grey, and strikingly larger than the average house cat, specimens up to 20 lb. in weight having been recorded.

The wild cats in Australia are in for a very easy time. They have practically no enemies. Poisonous snakes might account for a few, while eagles would kill kittens that ventured out in the daytime, and a fight has been described between a wild Tom and a native tiger cat in which the former was killed. Their agility in climbing would keep them clear of dingoes. The results of their depredations are already noticeable. Ground game and small marsupials are in certain districts being greatly diminished in numbers, and it seems that in the future we can count on a partial extermination of certain species. Their influence on the rabbit question remains to be seen, and it is to be hoped that in this direction they will be of some use to the country and justify their existence.

SUGGESTED IMPORTATION OF HUMBLE BEES.

A CORRESPONDENT asks for advice as to the importation of humble bees, for fertilising red clover, a purpose which these insects fill in England, New Zealand and other countries. Humble bees can be obtained quite easily in New Zealand, as there are several people there who collect and sell them. The New Zealand Department of Agriculture will no doubt put an inquirer in communication with dealers.

We do not, however, advise the importation of humble bees into this State for the fertilisation of red clover, though successful in New Zealand. There is no need for them in New South Wales, as we have so many long-tongued native bees that can fertilise all honey-bearing flowers. These native bees are wanting in New Zealand. Moreover, this Department has several times imported numbers of gravid female humble bees from New Zealand, but though every care was taken in turning them out and trying to establish them in suitable localities, not a single specimen has ever been seen a week after they were liberated at any of the places selected. Our last humble bees were liberated, half near Cooma and the other half at the Glen Innes Experiment Farm.—W. W. FROGGATT.

The Banana.

W. J. ALLEN.

THERE are imported into this State from two to three hundred thousand bunches of bananas annually. These supplies come principally from Queensland and Fiji. When one considers the average high price which this fruit realises, one asks naturally why should not our State take some more considerable part in this very large and increasing industry. From Coff's Harbour northward on the coast-line, we have conditions of soils and climate particularly suitable for this class of fruit.

Soil.

The essential features of a first-class banana soil are, first, an abundant moisture supply; second, good drainage. The soil best suited for the cultivation of the plant is a warm, deep loam, with a good proportion of humus.

Climate.

The banana is essentially a tropical plant, and thus it will not bear a cold climate, but grows most rapidly and luxuriantly in our warm coastal districts. It may be planted near to the sea coast, as an atmosphere impregnated with salt has no injurious influence on the plants. Care must be taken, however, to protect them from the heavy winds. An ordinary breeze will not prove destructive, but strong winds tear the leaves into ribbons, and at times the plants may be blown over. Positions subject to heavy frost should be avoided.

Preparation of the Land.

It is always preferable to clear the land of timber before planting. In some cases growers only partially clear their holdings, but this incomplete clearing is a doubtful economy, and can only be regarded as a compromise to be made when capital is lacking. A properly cleared field means less expense in cultivation, better and more thorough working of the ground, and greater facility in handling the crop.

When preparing the soil, it should be thoroughly broken up to a depth of at least 12 inches. Care should be taken to remove all roots or decaying wood, as these are liable to convey fungous diseases to the young plants. Thorough deep ploughing, followed by a good harrowing, will assist the plants to root deeply, and prevent to a large extent the danger of their blowing over.

Selection of Plants and Propagation.

There are three kinds of plants used for propagation :—(1) The old stumps that have produced fruit; (2) large offsets or suckers, from 6 to 8 months old, with well developed bases or corms; (3) small offsets, from a few weeks to 2 or 3 months old, and from 8 to 30 inches high.

The best and more generally used plant for propagating is the large offset or sucker. This is generally removed from the stem by means of a sharp spade, the earth being first of all removed carefully, so as to expose the junction of the offshoot with the parent. It is essential with such plants that they be cut back to within about 6 inches of the corm. These larger plants are further prepared by the removal of all the old roots. Small offsets are as a rule not selected on account of being too weak and delicate.

Planting.

The laying out of the field may be carried out in a similar way to that adopted when marking out lines for an orchard. The suckers should not be set at less than 15 feet from each other. When planted, the earth around the sucker should be firmly pressed down by the feet, so as to prevent drying out of the soil. The size of the hole which it will be necessary to dig will depend upon the preparation which the soil has already received. The top of the corm, however, should not be more than a few inches below the surface of the soil of the field.

Bananas are planted at all seasons of the year. September is considered the best month for planting in this State. If planted in the early spring the growth is much more rapid than with later plantings.

Cultivation.

The size of the future plant is no doubt influenced by the sucker chosen and its vigour. The vigour of the plant can only be maintained by thorough cultivation and attention. Weeds must be kept in check, and the ground should be regularly stirred. The importance of frequent cleaning of the ground must not be underestimated.

Removal of Suckers.

The number of offsets which should be allowed to grow will depend upon the fertility of the soil, the moisture available, the cultivation, &c. In a favoured locality it is not unusual to allow two or even three suckers to start when a corm is planted. Unless the conditions are very favourable, it would be better to leave no more than one at the beginning, and to allow another to start several months later. The first will form the main plant, and the second will be known as the first sucker. Still another sucker—a second on the opposite side of the plant—may be allowed to grow some months later, and before the first bunch of fruit is produced. But how often the plant may be allowed to support a new offset will be determined by the same factors as given above.

Time for allowing an offset to grow.

Growers can generally time their crop to meet the market demands. This is done by selecting the right time to allow new plants to start. It is, however, best not to remove the suckers when they first appear, but to wait till they are a few inches high; if this is not carried out, no doubt fresh buds will start into growth.

Crops.

With proper care and attention, the first crop should be harvested twelve months from the time of planting. The bunch is cut with a portion of the stem (1½ to 2 feet), for the convenience of handling. The terminal flower buds should be removed at the same time. The correct time for picking the fruit varies, and it is only by experience that the exact stage of maturity which is best under the circumstances, can be known. Where the market is handy, the fruit should be allowed to become "full," and can as a rule be picked from a week to ten days before it is ripe. When shipping long distances, the bunch is cut much earlier than is the case when the market is near by. However, it is usually admitted that it is best to allow the fruit to get as full as is safe, considering the time necessary to place it upon the retail market.

The profit in banana-growing goes to the man who forwards fine fruit, and one of the first things to learn in marketing is care in handling the produce. Freight is a large item in the cost of production, and the charges are the same for a large bunch as for an inferior one. Not only this, but large fruit sells more readily and at a higher price per pound than small fruit. A fully grown bunch may contain from 3 to 16 "hands," and a hand from 10 to 20 fruit. In the West Indies, buyers consider 9 hands a bunch, 8 hands counting for three-quarters of a bunch, and 7 hands for only half a bunch on the price paid.

Varieties.

There are many varieties of bananas under cultivation, but those principally grown for shipping are the Cavendish Sugar, Gros Michael, Red Spanish and Jamaica.

GALLS ON LEMON TREES.

A CORRESPONDENT on the North Coast forwards specimens of lemon cuttings affected with knotty swellings. The galls, or swellings, are caused by small wasps, which lay their eggs in the woody tissue of the plant; the tiny maggots feeding on the wood cause it to swell in this manner. It is not uncommon on lemon trees.

The only way to get rid of them is to cut out these galled branches, for from them come a fresh swarm of tiny wasps that will puncture the twigs and deposit a fresh supply of eggs. When these little wasps are plentiful they might be kept off by spraying the trees early in the summer with some oil emulsion.—W. W. FROGGATT.

Insects Infesting Woollen Tops.

THE COSMOPOLITAN SKIN WEEVIL (*Dermestes cadaverinus*).

WALTER W. FROGGATT, F.L.S., Government Entomologist.

IN the June number of the *Agricultural Gazette* I published an account of the damage caused by the intrusion into woollen tops of the larvæ of that Cosmopolitan Clerid Beetle (*Necrobia rufipes*), commonly called the Red-legged Ham Beetle in England, on account of its fondness for dried hams, but better known on boats trading to the Islands as the "Copra Bug," on account of its fondness for dried cocoanut. Since the paper was written, a great deal of information has been collected regarding the abundance of this pest about the Sydney wharves, and large quantities of copra were examined, with the result that a report was furnished showing that the fumigation proposed would have to be done in the holds of the ships, and that fumigation of the discharged copra, if practicable, would probably tend to spread the beetles more than suppress them.

On the publication of my report in Japan, several authorities among the shipping people in that country stated that the woollen tops were not damaged by the "copra bug," but by weevils. It was not, however, until 12th April, 1912, that a second consignment of woollen tops, damaged by beetle larvæ, was forwarded by Mr. J. B. Suttor, Commercial Commissioner in the East, together with a small box containing specimens of the perfect beetles causing the damage. Though all the woollen tops previously received had been infested by the copra bug, all the second consignment were damaged by the Cosmopolitan Skin Weevil (*Dermestes cadaverinus*).

This is a very much larger, boat-shaped, oval, elongated, dark-brown beetle, very easily distinguished from the small metallic blue copra beetle, while the curious hairy larvæ of the skin weevil is very easily recognised among bones, sheep-skins, and other produce. This is the common pest of both the sheep station and hide and skin stores, where they do a great deal of damage, to sheep-skins in particular.

The sheep-skin weevil is evidently very common in many of the ships trading to the East; and, as stated in my report, I recently had a block of soft pine wood from the hold of a ship trading to Japan, which, though whitewashed when the hold was cleaned up, was riddled by the larvæ of these skin weevils, and on examination was found to be sheltering hundreds of the perfectly developed beetles. There were, I was informed, a number of similar blocks of wood in the hold, all of which were, in all probability, in the same condition—quite capable of producing enough beetles to do a considerable amount of damage to any cargo. Therefore, not only should the holds of all steamers carrying hides, skins, and bones be thoroughly fumigated every voyage, but all the loose fittings should be carefully examined and removed if harbouring these weevils.

Insects Infesting Woollen Tops sent to Japan.

Our Poultry Industry.

W. E. BOUTCHER, Forest Hill, Canterbury.

In dealing with such an important industry as that of poultry it will be necessary to go back some years, in order to point out where we have lost and subsequently gained. In this short article I do not propose handling the industry outside our own Australia, where, to my mind, the domestic fowl has made great strides.

Some sixty or seventy years ago there was no poultry industry. Gallinaceous poultry were kept by individuals for home consumption, but markets were supplied from farms where turkeys, geese, and the usual domestic fowls were bred and kept in a most haphazard fashion.

Until about fifteen years ago, poultry-farming was carried on in a most crude fashion;—breeds were not considered, feeding was misunderstood, and the general management usually meted out was most unsuitable. Utility, which after all is the only backbone upon which the industry can rely, was altogether ignored.

The show pen was responsible for much of the rottenness that was manifested during the period mentioned, as should an exhibitor display a utility specimen he was regarded as a novice unworthy of the name of poultryman. This was certainly beneficial to the feather-breeder, but detrimental to the industry; and when we consider that the only value of a hen lies in her productiveness, the stand adopted by poultry shows was anything but desirable.

About the year 1896 many became disgusted at this state of things. They saw clearly that the industry was languishing, and the endeavour to crush it out of existence was met with a strong hand and determination.

Some will probably say, "How did shows try to crush the industry?" Well, let me explain. In years gone by we were possessors of exceptionally fine breeds of poultry. The Bramah, Cochin China, Langshan, Minorca, Spanish, Hamburgh, and a few others were all that could be desired, and they would be as good to-day were it not for the freaks and fancies demanded by the show pen. The Cochin China was a producer of 220 eggs in a year; the specimens available to-day would scarcely yield that quantity in a life-time. The Langshan was sometimes given the name "Black Cochin," but this was only done to give the Buff Cochin an ally. These two birds were ruthlessly slaughtered by advocating feather in one and length of leg in the other. These once popular and beautiful breeds of poultry have fallen to a low degree in usefulness. Then there were the remaining three, viz., Minorca, Spanish, and Hamburgh. They, too, have been ruined, and are now found only on places where fancy poultry are desired.

At the period of which I am writing, the Orpington and Wyandotte families were most popular. They were certainly good. The Black Orpington and the Silver-laced Wyandotte were, *par excellence*, heavy breeds. The Orpington was not the clumsy present-day type—it was more of a utility stamp; but, as time went on this also became the prey of the feather-breeder, and consequently, the old Orpington now occupies a low-down place. The Wyandotte, too, has receded wonderfully; this also can be placed at the feather-breeder's door.

About the year 1900 the industry was in a low state; egg-production was by no means what we find it to-day; table poultry were good, but prices obtained did not recompense for the outlay and trouble to bring them to table quality. About this time interested ones thought that an egg-laying test would probably place the neglected interests on something of a footing. The thought soon turned to action, and the present Hawkesbury College Egg-laying Competition became an accomplished fact. These tests increased in popularity, until to-day we find them household words all over Australia.

When egg-laying tests became general shows became less, and the industry soon regained what it had previously lost. With the advance of utility poultry, the heavier breeds became decidedly unpopular. Many who had heretofore pinned their faith to Black and Buff Orpingtons and Silver Wyandottes, discarded them for the beautiful egg-producing Leghorn.

The question now arises, was the change beneficial? If so, how? Well, the suburbanite who keeps a few head, as well as the breeder of hundreds, desires profits; and as monetary gain is desired from theproduct of the hen, the reason for the change is obvious. It would not be advisable to root out the heavy breeds of poultry, even though they be less profitable than the sprightly Leghorn, as Orpingtons and Wyandottes can be highly recommended to those who desire a delicate and delicious dinner.

The industry has worked out its own salvation; it has marked out its own road. The observant poultryman has evolved a strain of producers which can yield high averages, and which have done much to advertise Australia and the Hawkesbury Agricultural College. Poultry-raising, when carried out by observant ones, will be a fine addition to the general farming, whilst those who desire to indulge in it exclusively are sure to find that it is all that is claimed for it, and that from £20 to £30 a year can be made from every hundred good producers. This, of course, can only be accomplished where proper care and attention are given to the industry, which has been so long neglected and muddled by those who profess to know so much about it.

Breeding for Egg-production.

GEORGE BRADSHAW.

DURING my visits of the present year to suburban and country districts, there was always a variety of questions at the close of each lecture, relative to some feature of poultry-breeding. At the majority of the places the bulk of the queries were concerning the merits of some of our best laying strains of fowls, and occasionally they were put in such a way as to infer that the purchases from the owners of these had not turned out as expected, while in more than one instance, there were distinct statements that the 200-egg, or other laying strains, which they had contracted for, had not been supplied.

Fowls belonging to the breeders mentioned have all made good performances at one or other of the Hawkesbury Agricultural College egg-laying tests, and as the questioners had made purchases from one or other of these breeders' yards, they thought these relations of the good layers should also be record breakers. My explanation to the respective inquirers was that the fact of the reputed sisters, daughters, or other relations of the prolific layers, failing to put up good performances, was no reason for them to think they had not got a straight deal; that most likely the fowls they purchased were a fair average of the breeders' yard, while the six which made the big score were above the average.

In relation to the many disappointments in regard to anticipated great laying, there is a good deal of misconception amongst the newer poultry-breeders as to what constitutes a good laying strain. The majority of them imagine that birds from an advertised strain of, say, 230 eggs, with careful management, should individually produce something approximating this number. This opinion is opposed to all the laws of breeding, for despite the old aphorism that like produces like, in the matter of egg-production—a cultivated faculty—it rarely does.

This will be better illustrated by the following performances at the respective Hawkesbury College Egg-laying Competitions. To make the point I am obliged to use the names of a few prominent breeders; this, however, is not taking any undue liberty, as their records have all previously appeared in the *Agricultural Gazette* and other reports.

Take Mr. S. Ellis, of Botany, perhaps the most prominent utility breeder in the State. Mr. Ellis first competed in the 1904 test, his Leghorns averaging 187 eggs. At the following one, his pen dropped to 156. At the next competition he made the fine average of 240 per hen, then he dropped to 222 in the 1909-10 test. The next year showed a further drop to 186, or an egg per hen less than his average of seven years previously. At the competition which closed on 31st March last, there was a recovery to 215. Still, this was 25 eggs per hen below his record in 1906-7.

Mr. Ellis has had a life-long experience in breeding, has thousands of stock to select from, and is agent for one of the American systems which purpose to tell the best layers; so when he cannot nearly reach his score of a number of years ago, how can people new at the game expect to do so?

Other prominent breeders have had the same experience. Mr. F. J. Brierley's scores are as follows in the respective tests:—195, 170, 189, 222, 211—a gradual rise and then a drop. Hillcrest Poultry Farm is the same, viz.:—171, 208, 199, 210, 232, 210.

Many others could be quoted, while Mr. Thompson's report, which appeared in the July *Gazette,* giving the winning totals for a number of years past, is confirmatory of the difficulty of retaining the good laying qualities, much less improving on them.

The winning totals for six hens from the inception of the competitions are as follow:—1,113, 1,308, 1,224, 1,411, 1,481, 1,474, 1,379, 1,394, 1,321, 1,389. It is true that the general average has increased, but those who care to analyse the figures will find that the improvement was chiefly amongst the poorer producers, and it substantiates the long established fact that fowls, whether in relation to appearance or internal properties, only occasionally produce their like.

The poultry fancier who has a hen of extra good exhibition qualities can mate her with the best existing male bird, and may not in a season produce a specimen of equal merit, and will be most fortunate if he gets one her superior. The egg-laying trait, as with fancy points, is an acquired property, and much knowledge of breeding is necessary to retain this property, while o improve on it requires skill in selection, which must be exercised continuously, and much patience.

The question then arises by what means the laying qualities of the respective breeds have been brought about, and how are they to be maintained. Mr. H. H. Stoddart, one of America's greatest utility breeders, writes as follows on this subject:—

> The claim that somebody in a few years made a 250-egg strain out of a 150-egg strain is "important if true." Query: Was the 150-egg strain a 50-egg strain once, and, if so, how long did it take for it to become a 150-egg strain? Five, or ten, or twenty years, think you, or a much longer period, and have the workings of heredity been changed and biological laws repealed lately to accommodate get-rich-quick enterprises?
>
> A phenomenal specimen, anywhere in the realm of living things, seldom yields phenomenal progeny. All that may be expected of the descendants of an Aristotle, or a Bacon, a Darwin, or a Lincoln, is that they will turn out "pretty fair."
>
> There is no principle of heredity that will make an exceptional hen that yields, say, 200 eggs a year, give progeny that will lay 200 also. Procure cocks from 200-egg hens and mate them to 200-egg hens, and you will not get progeny that will average 200 eggs each. You may possibly get a few 200-egg birds, but probably not one. You may have a few that will yield 140 or 150 eggs each, but the tendency will be to revert to the average of their ancestry years and years ago.
>
> Change of climate in some cases, or anything that gives a shock to the reproductive system, in-and-in breeding, for instance, under some circumstances, or other forms of abuse, will suddenly start great laying. Temporary phases are produced, but this is not founding a "strain."
>
> Select, by all means, the best layers for breeding, but do not hope too much and tell the truth too little.
>
> Remember the general law in biology, that traits which it took ages to produce show an inveterate tendency to stick, and, even when for several generations they are apparently

killed out, they will " bob up serenely " for no reason we can detect. Also the tendency to slip back to a normal or ancient average is the greater the more recent your strain is.

Reverting to the occasional retrogression in what are known as our best strains, it must be recollected that in the English and American egg-laying competitions, and at their Experimental Colleges, all the birds are trap-nested, whereas in the Australian tests they are not. If six of our hens lay 1,200 eggs, each gets credit for 200, and under the conditions the owner is justified in advertising them as a 200-egg pen. At the same time, one of these birds may have laid 250 eggs, and another one but 150, and there being no actual means of knowing the bad layer from the good one, all are placed in the breeding pen, and there is always the greater likelihood of the more normal layer reproducing her trait than of the excessive producer doing so. This feature is often responsible for the disappointing results.

In America, on the other hand, each bird gets credit only for its actual laying, and by this means the drones can be, and are, excluded from the breeding pen. The trap nest is the latter-day method, by which the majority of the laying strains in America have been built up. It is, however, only investigators and experimentalists who can afford the equipment and expense of operating them. The American farmers and other utility-breeders usually purchase their eggs and breeding stock from some of these experimentalists, who make trap-nest-breeding a speciality.

Consequently, to get the best layers we must breed from the best, and whether by trap nest, single pen testing, or other means, to keep a good laying strain good, there must be the most vigorous culling and selection each returning breeding season.

The majority of the poultry-breeders in the State are doing well. They would do still better, did they secure even a flock average of twelve dozen per hen, rather than the expected but mythical twenty dozen.

Line Breeding.

One other reason why there have been disappointments in the purchase of stock and eggs from acknowledged reliable breeders is that the purchasers are in many cases unacquainted with the laws of mating. Pullets may have been purchased from, say Brown, and rather than getting a male bird of the same strain, one of another line of blood is secured, and even if of a good egg-producing family, this introduction of foreign blood may be disastrous.

In America, when a strain. either for appearance or internal qualities, has been evolved, to establish or fix this characteristic, what is known as " line-breeding " is adopted. Many years ago, Mr. J. K. Felch, an American breeder and judge, published a chart, showing how this line breeding can be conducted, and American breeders now practise it extensively. Of a great deal of literature on line breeding, perhaps the following by the Editor of the *American Poultry Journal*, is as explicit as any :—

Breeding from animals that are closely related is inbreeding. To continue this class of mating for a series of years, until your whole flock is uniform in the characteristics you have been striving for, is line breeding. A line-bred bird is one that has been produced by inbreeding, but it does not follow that because a bird has been produced by breeding in and in that it is a line-bred bird.

All inbreeding operations are predicated on having birds that possess qualities that you want to intensify and perpetuate. It does not matter whether it is shape, colour, feathering, or prolific laying, or all combined, in one of your birds, you can, in a few years, by judicious selection and inbreeding, have a whole flock with the desired qualities transmitted and fixed so they will be possessed by almost every chick you hatch. When that time comes you have established a strain or family of your own.

To the breeder who has, through a number of years of judicious inbreeding, established a family line or strain of any variety of fowl, the introduction of new blood is a serious problem, and should call out his most careful thought. In such a case the object of introducing the new blood is to keep up the vigour of his flock without disturbing the family type.

To introduce new blood, my method is to procure a cockerel from a flock as near like mine as I can find. I mate him with several of my best hens and pullets, keeping the eggs separate and marking the chicks. I have always found that one bunch of chicks from such matings will average better than the other. I have found this true even when mating a non-related cockerel with several full sisters. There are several theories that may be advanced as to why this is true, but I do not believe anyone can tell why it is.

In introducing new blood, we will in many cases find that it does not mix well with what we have in our yards, and should not be used. If you use a cockerel for introducing new blood you have an opportunity of making several experimental matings before using any of the new blood in your main breeding pens. The second season, from the chicks that have averaged the best, use the best cockerel and pullet. Mate the cockerel with his dam and mate the pullet with a choice cockerel of your strain. The chicks from these two matings can safely be used in your breeding pens. The chicks from such matings would have only one-eighth of the new blood, and it being introduced through the male, the type of your strain will not be disturbed.

Mr. T. F. McGrew, another American authority, contributes the following on the same subject:—

The main difference between line breeding and what is commonly called inbreeding lies in the fact that the one improves, builds up, and strengthens the product, while the other leads to deterioration. Line breeding refers to creating a family that will have such powerful influence over its offspring as to determine in advance that they shall each and all of them have the most perfect family resemblances.

Inbreeding cannot be carried on to an unlimited extent without utterly destroying every desirable influence that was present in the beginning. No matter how powerful the constitutional ability of the original may be at the beginning, it can be materially undermined where inbreeding is applied to an unnatural extent. Many flocks have been utterly destroyed through an injudicious adherence to inbreeding.

The secret of success lies largely in the vigour and reproducing ability of the females. One to three females can best be used for the start. Mated with these must be a male as nearly perfect as it is possible to have him.

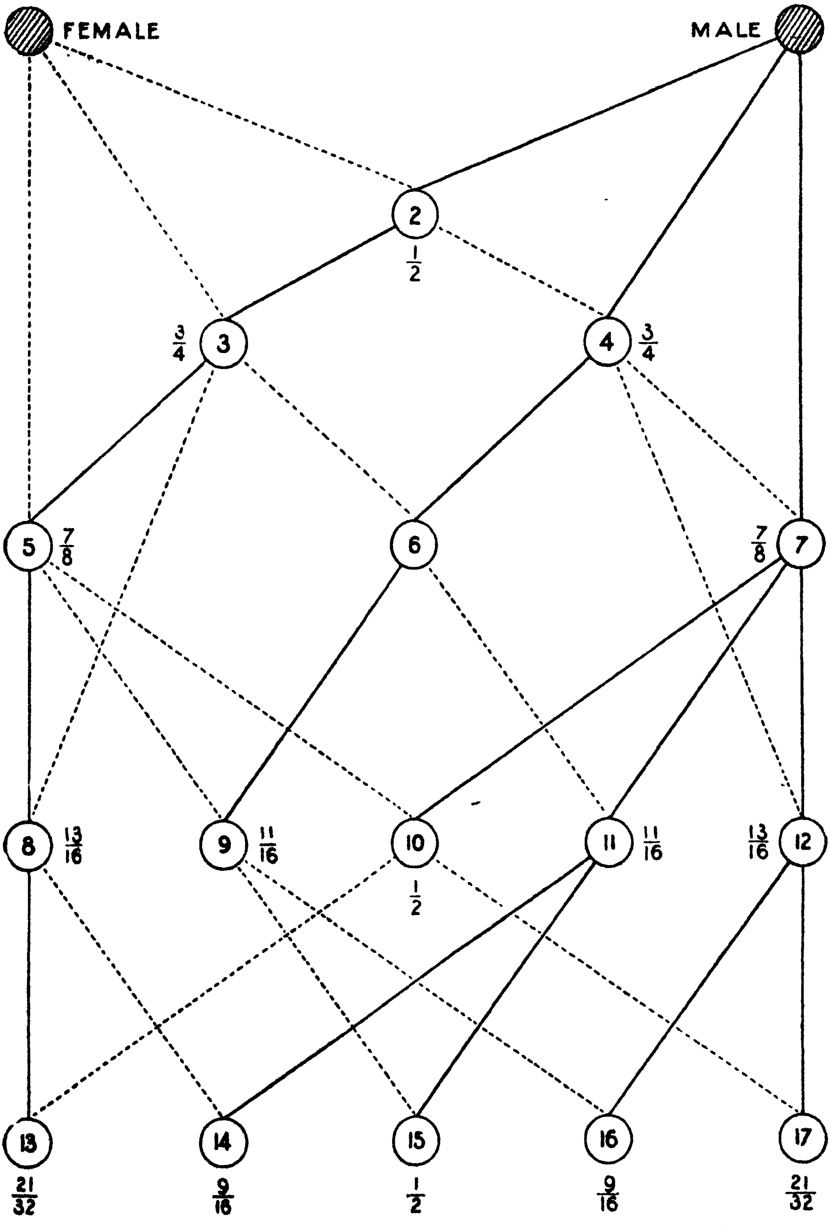
One must use only hens that have proven to be extraordinarily prolific in egg-production. Male birds from such only should be used. One or two of the most prolific egg-producers should be kept apart for the production of the cockerels each year that are to be used in the balance of the flock. One cockerel selected from the best egg-producing hen should be reserved for mating with this. In this way a sufficient number of cockerels can be produced each year for mating with the most prolific egg-producing hens, from which may be grown the flocks for another year. This gives us males and females non-related, which adds strength, vigour, and influence to the prolific egg-production.

To illustrate: Line breeding governs to the greatest extent breed characteristics and colour. On the other hand, selecting the best egg-producers and keeping the breeding lines as distinct as possible within these flocks, adds to the strength, vigour, and egg-producing qualities, without governing the type of the fowl.

Inbreeding promiscuously, without forethought or guidance, will destroy the egg-producing powers even more quickly than it destroys the exhibition qualities. No one can hope to succeed in either of these lines who does not keep careful records and know the producers of quality on one side, and the egg-producers on the other.

Appended is Mr. Felch's chart, and the explanatory notes as given in Lewis Wright's Poultry Book :—

In reading this chart, every dotted line means a female—*i.e.*, a hen or pullet, and every unbroken line a male. Wherever two such lines meet *at a point* the circle at that point denotes the produce of the mating, bearing a number distinguishing it as a group or product; while the fraction outside the circle denotes the mixture or proportion in that



Mr. J. K. Felch's Chart of Line Breeding. (*From Lewis Wright's Poultry Book.*)

product of the blood of the two original units from which is bred the strain. The first year, for instance, the original pair produce group 2, whose blood is half-and-half of each. The second year the original female, or one of them, is bred to a cockerel from group 2, and the original male to a pullet from group 2. Thus are produced groups 3 and 4, each of which possesses three-fourths of the blood of the unit on its own side of the diagram. Here begins the real work of the breeder, since these mates now taken from group 2 must be most carefully *selected to type*, according to that "course of selection" which we have already discussed. From the very first all depends upon this, and, of course, the two original units have been chosen with equal care, so far as money and opportunity allowed. The third year a cockerel from group 3 is mated with the original hen to produce group 5, and pullets from group 4 to the original male to produce group 7, all of which possess seven-eighths of the blood on their own side, and are to be rigorously selected *true to type* as before.

But the most noteworthy mating this year, to which we would call special attention, is that of a pullet or pullets from group 3, with a cockerel from group 4, producing group 6. It will be seen that all the members of group 6 possess equal or half-and-half blood from the original parents, as much so as group 2. We also mate a pullet from group 5 and a cockerel from group 7, each of these owning seven-eighths of the blood of one ancestor, and we again produce in group 10 a progeny whose blood is half-and-half. Now supopse we had mated brothers and sisters from group 2 to produce the half-and-half blood and age of group 6, and brothers and sisters from these to produce similar equality of blood at the age of group 10, the result of such incestuous inbreeding would have been swift degeneracy. As it is, we have made our matings from lines characterised mainly by the original male and female, and yet preserved the same mathematically exact equality of blood in our group 10. A generation farther on we can produce group 15 as shown, from groups 9 and 11; or we might have mated groups 8 and 12; or the produce of the former may be mated with that of the latter. We have thus seen how it is possible to keep up the half-and-half blood of a cross, intact and exact, without any loss of size, fertility, or vigour.

Three Strains from One Stock.—We also see plainly from this chart that by the time we have reached the stage even of group 10, we have got in our hands practically *three strains*; for while group 10 possesses equal blood of both sides, group 8 has thirteen-sixteenths of the blood of the hen, or practically represents the female line; while group 12, in like proportion, possesses the blood of the male line. Yet all are related sufficiently to prevent evil; and all have gone through the same "course of selection" towards our own fixed type. From this point we have ample material to go on with indefinitely, and need not pursue that matter farther. The bottom row of groups simply shows some of the results in the next generation. But one point more may be illustrated. Suppose that for some reason—as for special cockerel or pullet breeding—we want to establish also a line of sires in which predominates the blood of the original female. The chart shows a cockerel from group 5 mated with a pullet from group 3, and a cockerel from the produce in group 8 mated with a pullet from group 10. The result in group 13 gives us the same proportions of blood, but derived through a cockerel line of breeding.

Whenever a cross is necessary in a strain, such a chart also shows the procedure that should be followed. The cross is treated as a new unit, and its produce re-mated back to the home strain in the same way, carefully selecting for the desired type as before. This is what breeders and fanciers term "breeding back" to a strain, and the philosophy of it can be clearly understood from such a diagram as that before us. Every cross thus involves more or less breeding back to the "line" afterwards; but this need not be carried to the extent of incestuous matings, or interfere with vigour in any degree. The out-cross is not used as immediate material, but to provide either pullets or cockerels for really breeding into the strain the following year.

STOCKS FOR PERSIMMONS.

PERSIMMON stock is always used. Graft right under the collar of the trunk, *i.e.*, just at the crown, where the roots branch from the stock. Clay well, and hill up to top of scion. The whip graft has proved the most successful, and an important point is to graft late in the season, just before the buds begin to swell.—W. J. ALLEN.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *via* Cowra.
Cardiff	Mr. D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. H. Vickers, Coreen.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. T. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Kareela	Mr. L. Haydon, Kareela.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. T. Glasgow, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *via* Inverell.
Lower Lawrence	Mr. E. T. Cooney, Lawrence.
Lower Portland	Mr. G. Gosper, Lower Portland.
Mangrove Mountain	Mr. G. T. Hunt, Mangrove Mountain.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *via* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, Penrose.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Samples of Wheat.

It has been decided to supply branches of the Agricultural Bureau with samples of grain and bunches of heads of the twenty-two varieties of wheat recommended by the Department for cultivation in various parts of the State. These comprise the leading varieties recommended for grain, hay, dual purposes, and green fodder. The collection should prove a valuable acquisition, especially for identification purposes, to members of branches in wheat-growing districts.

Secretaries intending to avail themselves of this offer are requested to make early application to the Department.

LECTURES AND DEMONSTRATIONS FOR OCTOBER.

Place.	Date.	Lecturer.	Subject.
	1912.		
Bonville	1 October..	Mr. Veterinary Surgeon Massy.	Veterinary Subjects.
Cowra	3 ,, ..	Mr. J. W. Mathews, Sheep and Wool Expert.	Lantern Lecture on Sheep-breeding.
	4 ,, ...	Mr. J. W. Mathews, Sheep and Wool Expert.	Practical Demonstration at Cowra Experiment Farm in connection with Sheep and Wool.
Cundletown	11 ,, ...	Mr. Veterinary Surgeon Massy.	Mammitis and Abortion in Cattle.
Forest Creek... ..	9 ,, ..	Mr. J. W. Mathews, Sheep and Wool Expert.	Demonstration in Wool-classing.
Mangrove Mountain..	8 ,, ...	Mr. Veterinary Surgeon Palgrave.	Equine Ailments.
Nelson's Plains ...	1 ,, .	Mr. J. G. R. Bryant, Assistant Fruit Expert.	Fruit Culture and Preserving.
Walla Walla	10 ,, ..	Mr. J. G. R. Bryant, Assistant Fruit Expert.	Fruit Culture.
Wallendbeen... ..	2 ,, ...	Mr. Veterinary Surgeon Palgrave.	Veterinary Subjects.
Walli	3 ,, ...	Mr. Veterinary Surgeon Sanderson.	Veterinary Subjects.
Wolseley Park ...	8 ,, ...	Mr. J. G. R. Bryant, Assistant Fruit Expert.	Fruit-growing.

LECTURES AND DEMONSTRATIONS IN COURSE OF ARRANGEMENT.

Place.	Lecturer.	Subject.
Crudine ...	Mr. R. G. Warry, Demonstrator in Apiculture.	Bee-keeping.
	Mr. J. W. Mathews, Sheep and Wool Expert.	Sheep and Wool.
Gunning ...	... Mr. H. S. Major, Assistant Sheep and Wool Expert.	Wool-classing.
Leech's Gully	... Mr. Veterinary Surgeon Henry	Veterinary Subjects.
Spring Hill ...	... Mr. Veterinary Surgeon Sanderson ...	Veterinary Subjects.

Beckom.

To a well attended meeting of farmers Mr. H. C. Stening, Assistant Inspector of Agriculture, explained the objects of the Agricultural Bureau, and it was decided to form a branch at Beckom. The following office-bearers were elected :—Chairman, Mr. J. Griffin ; Treasurer, Mr. S. Lovejoy ; Secretary, Mr. S. Stinson.

Bungalong.

Mr. Inspector Wilson addressed the members of this branch on 29th August on the privileges the Department concedes to branches of the Agricultural Bureau and the consequent benefits which the farmers derive therefrom. He pointed out that the success of a branch depended largely upon the energy and enthusiasm of the honorary secretary.

The lecturer then dealt with wheat-growing from an economic standpoint. He emphasised the necessity for fallowing and strongly recommended a rotation of crops. Field peas were advocated as a particularly suitable crop for this district ; besides returning a payable yield the growing of peas kept the soil in a permanent state of fertility.

Crudine.

A branch of the Bureau has been formed at Crudine with Mr. W. S. Suttor as Chairman and Mr. T. W. Clarke as Secretary. Arrangements are being made for lectures in sheep and wool and bee-keeping by Messrs. Mathews and Warry respectively.

Forest Creek.

On Thursday afternoon, 15th August, Mr. J. W. Matthews, Sheep and Wool Expert, gave a demonstration in the method of handling wool. There was an attendance of between thirty and forty. At the conclusion many questions were asked and very fully answered by Mr. Mathews. In the evening a lantern lecture was given, dealing with the experiments in cross-breeding of sheep conducted by the Department, and the figures given were rather surprising to some of the members.

The opportunity was availed of by Mr. Mathews to inspect some of the flocks in the district, and the members much appreciated the advice which was given. Mr. Mathews will pay a second visit to the district on the 9th and 10th October, when he will give a demonstration in Wool-classing.

Inverell.

On 9th August, Mr. Veterinary Surgeon M. Henry delivered a lecture on contagious abortion in mares to a well attended meeting of the above branch. The lecture was much appreciated, and a number of questions of interest were asked.

Kellyville.

On 22nd August, Mr. Bradshaw had a splendid audience to hear an address on Artificial Incubation.

The lecturer said there were three essentials to obtain the best results—the eggs, the machine, and the operator. Many considered the machine responsible for good or bad hatching, and thought it the most important. In this they certainly were wrong; well fertilised eggs from healthy stock being of first importance, the machine coming next, and no matter how perfect the first two factors, the operator had to use common sense, together with carrying out the maker's instructions, to get successful hatches. The audience was told that latter-day methods of breeding for excessive egg-production had put a strain on the producing organs never intended by nature, with the result that no matter how apparently healthy the hens may be, nor how vigorous the male bird, there was now in every progressive poultry yard considerable percentages of infertile eggs. When this was the case, the percentage of weak-germed eggs, and dead chicks in the shell, would also be great. Take a dozen eggs from the ordinary common fowls running about any holding or roadside, place them in an incubator with those from our 200 egg-laying strain of pure-breds, and irrespective of breed, the birds kept under natural conditions will give the best results. This, said the lecturer, is the penalty we have to pay for perverting nature's laws to our needs, and no matter what our efforts in the way of breeding from healthy, vigorous stock, or how perfect the incubator, rather than the 100 per cent. occasionally claimed by manufacturers, the poultry-breeder who closes his hatching season with seventy chickens from every 100 fertile eggs is to be envied.

Penrose.

At the last meeting of the Penrose Branch of the Agricultural Bureau, Mr. V. J. Phillips, from Sydney, read the following paper:—

The object of this paper is to give you my ideas of the best and most profitable varieties of fruit to grow for the Sydney market. I would point out that I am taking no account of varieties which may suit a local demand (such as Goulburn), but am dealing simply with the Sydney market.

Before going further, I would like to recall a remark one grower made to me on my recent visit to your district. He said he thought that, with all the planting going on around him, in a few years' time the industry would be overdone. Now, I take a totally different view to this, as I think, so long as growers confine the trees in their orchards to good standard varieties that come in at the right time, they need have no fear whatever of over-supplying the ever-growing demand of a market like Sydney, which draws its principal supplies, amounting to hundreds of thousands of cases, from other States and countries.

I will deal first with apples, and will divide them into two classes. The first class is marketable in midseason, coming in after the Cumberland district early apples are over, and before the Tasmanian apples are coloured, and consists of *Jonathan*, *McIntosh Red*, *Lady in Snow*, *Trivett's Seedling*, *Buncombe*, and *Five Crown*—all eating apples; and *Granny Smith* as the only cooking apple. From my experience, these seven varieties are likely to give growers most profitable returns, as they not only comprise the best varieties, but come in at a time when the market is comparatively bare of good coloured apples.

In the second class I am giving you a list of apples which would have to be kept back and marketed not earlier than August. They include *Cleopatra*, *Yates*, *Rokewood*, *Cox's Orange Pippin*, and *Statesman*. These five varieties are the pick of the late sorts, though *Granny Smith* could be grown for either class. The main idea of the two classes is that the first should precede and the second follow the Tasmanian fruit, which, from the end of March until the end of August, rules values in apples on the Sydney market; and although your district may be able to grow apples quite as well as Tasmania, it seems a wise policy to dodge the market when the bulk of their supplies are on hand.

Now, some growers, who have a mania for trying all kinds of big named and little tried varieties, and who forget, when being advised by nurserymen, that "all men are liars," have orchards that represent more an experiment farm than one planted for a living; and these orchardists may be disappointed that I have not put more varieties in my list; but I have simply put in the best sorts, and those likely to bring the biggest prices.

The experience of Tasmania, Victoria, and the Cumberland districts all point to a few varieties, which, being proved the most suitable to climate and market, are grown accordingly.

In Cumberland the only eating apple grown in any quantity is the *Carrington*.

Tasmania's immense apple output is practically confined to *Scarlet Permain*, *Adam's Permain*, *New York*, *Jonathan*, *Sturmer Pippin*, and *French Crab*; and it is nothing unusual there to see large orchards growing only one, or perhaps two, of these varieties.

Local growers here seem to mostly prefer a good all-round mixture, with the result that probably a portion of their orchard is planted with the right varieties, and is paying well, while the rest, with its mixture of second-rate and fancy-named sorts, may not be even paying expenses.

My advice is, therefore, to specialise in a few varieties, proved to be best suited to soil and market, and to experiment with others in very small doses.

Turning now to peaches, the best varieties of these to grow do not ripen before the end of February, when the Cumberland Elbertas are well over, and are as follow:—*Late Italian Cling*, *Late Italian Slip*, *Lady Palmerston*, *Late Crawford*, *Elberta*, *Salwey* (a slip of great promise, ripening in Victoria in March), and *Pullar's Cling* (another high-class Victorian peach).

About five or six years ago, when the fruit-fly was at its worst in the County of Cumberland, any peaches ripening later than January were destroyed by this pest, with the result that growers rooted out the majority of the late peaches, and that only early varieties have since then been planted. Now this leaves a big shortage in the supply of peaches for the Sydney market after the middle of February, and it then depends almost solely for its supply on peaches imported from Victoria. Even supposing Victoria has a big enough surplus to supply Sydney with all it required (which is not likely ever to occur), your peaches could be landed in Sydney with so little handling, and so much fresher than imported stuff, that it would always command first sale and best prices. This advantage of freshness is not of so much account when considering apples or pears; but with peaches, to have them fresh and in good order, is pretty well the main item. Taking into consideration your immunity from fruit-fly, and other natural advantages, I think the correct varieties of peaches would be the most profitable line you could grow.

Pears are not what I would advise you to plant. Tasmania has a very large output, and Victoria is growing all varieties of pears in such immense quantities, that Sydney market, in an ordinary year, is kept well supplied. In a big crop year, such as 1910–11, choice Williams and other good mid-season varieties sold as low as 2s. per case, which would not pay expenses. Still the later kinds are always sure of good prices. The list I am giving now can be cool stored without fear of waste until late in the season, when good prices are obtainable. The best of the late varieties are *Josephine*, *Broom Park*, *Winter Nelis*, and *Winter Cole*. The two first-named are the best keepers.

Apricots, I was surprised to find, are not grown in your districts. If they would thrive there, they should be very profitable, as they grow into very large trees and bear heavily. *Moore Park* and *Hemskirke* are the only varieties worth growing. The canning factories will always take these varieties at from 5s. to 7s. per bushel, which is a good payable price to fall back on in the event of better not being available.

In conclusion, I must say I predict a great future before your district. Your land is so cheap, the fruit thrives so well, and you are so close to the Sydney market, that it cannot fail to go ahead. The only requisite needed is up-to-date growers, and it is in helping to produce these that the Bureau is doing such valuable work.

The Secretary of the Penrose Branch wishes to have it recorded that the rainfall in his district for July was 906 points.

Sackville.

Mr. R. Bowles, Honorary Secretary of the Fruitgrowers' Association, addressed the members at the last meeting on the advantages of co-operation, and outlined in detail a scheme in that direction, which was endorsed by members present.

Wallendbeen.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a practical demonstration in pruning at Mr. Gormley's orchard on the 10th August to a good attendance of farmers. The trees which were three years old were pruned so as to start them with a low head, with main limbs cut back hard. Mr Bryant explained that pruning on these lines will produce strong, stocky, well-knit framework, capable of carrying the future crop of fruit. It was pointed out that in pruning Jonathans the light laterals should be left long, whereas in most other varieties, which are spur-bearers, these shoots may be cut back much further.

Wetherill Park.

At the request of the Wetherill Park Progress Association, Mr. Bradshaw gave an address in the School of Arts on the 30th August on Utility Poultry-keeping. The audience received two hours practical talk and information on several branches of the subject.

The lecturer said the majority of breeders, when they purchased eggs or birds of reputed big laying strains, were frequently disappointed when the egg returns fell short of the strain's reputation. This feature, he said, would always obtain. Excessive production was a cultivated characteristic, and one which was rarely transferable to the progeny. Like produces like only under natural laws and conditions. A capacity for laying 200 eggs per year by a hen is an acquired character, and if mated with a male bird of a like prolific family, will but rarely transfer this trait to the progeny. It may be transmitted in a slightly increased degree to one or two of the specimens, but the overwhelming number of the progeny will fall far short of the parents' records. There is a continual effort to revert to the original wild fowl's laying of twenty or thirty eggs in the year. Hence to maintain, much less improve, the heavy laying trait, there must be continual selection and mating of the best layers, otherwise the flock's record will soon revert to very ordinary production.

The audience was told that the present day craze for Leghorns was not justified. They might lay a few eggs more in the twelve months than the heavier breeds. The latter, however, pay best, through the now really excellent market for table fowls, the prices in the auction rooms going as high as 9s. per couple for meaty cockerels.

Wolseley Park.

At a well attended meeting of the Wolseley Park Branch, Mr. T. Bagust, jun., read an interesting paper on dairying. Special stress was laid upon the necessity for herd-testing and culling out the wasters. Mr. Bagust says it pays better to keep one cow returning 30s. per month in the season than two cows returning £1 each per month. Growing of suitable fodder crops, and especially the conservation of green fodder in the shape of silage, were urged by Mr. Bagust to be essential for successful dairy farming.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

SUMMER CROPS FOR BREEDING HORSES.—"A.D.D.": The best summer fodder crops are lucerne, maize, sorghum, cowpeas and millet. These are often used for feeding to horses, but with the exception of lucerne are not suitable for grazing purposes, as the horses do too much damage tramping down the crop. Provided the land is suitable, lucerne should certainly be the best crop for your purpose. It is an excellent forage plant for horses. The best results are obtained when the animals have access to some other feed, such as grass. The combination of grasses or cereals and lucerne gives better results than lucerne alone.

Lucerne is usually sown at the rate of from 10 to 15 lb. per acre; maize, if sown in drills, from 8 to 10 lb., and broadcast from ½ to 1 bushel per acre; sorghum, drilled, 5 to 10 lb. per acre, broadcast from 30 to 40 lb. per acre; millets, drilled, 6 to 8 lb. per acre, broadcast 12 to 15 lb. per acre; cowpeas, drilled, 15 to 20 lb. per acre.

Lucerne can be planted either in the autumn or in the spring; the others should be sown in the spring, as soon as all danger of frost is over. Sowings can take place in most seasons up to as late as December.—GEORGE VALDER.

DRAINING ORCHARD LAND, &c.—"D.F." (Helensburgh): Drains may be placed in every second row. Later, if these are found insufficient, drains may be placed in each row, but this will be rather expensive.

Trees ceasing to grow on one side, and eventually dying back, is a trouble which has been noted in different parts of the State. No definite cause has as yet been assigned to it. Possibly it may be caused by some defect or trouble in the subsoil. The soil around the trees should be well worked, and lime applied, and after an interval of a few weeks a liberal application of stable manure should be worked around the trees. If stable manure is not obtainable, the fertiliser recommended in the pamphlet forwarded to you should be applied.

Your questions respecting standard fruit cases have been answered by letter. An article on the subject will be published shortly.—W. J. ALLEN.

ARSENITE OF SODA FOR KILLING TIMBER.—"C.M.": Experiments so far conducted with arsenite of soda solution applied to stumps indicate that it appears to kill the stumps right out, and no suckers have been observed. I think that the treatment is so effective that you can depend upon it, as if the poison is properly applied, the stumps will never sucker. The poison can be applied at any time of the year, but it is likely to give the best results if applied at the same time as ringbarking is carried out, viz., from January to March. The greatest advantage in your case would be that the trees die and dry out so much more quickly, and the timber is, therefore, readily available for sale.—GEORGE VALDER.

"P.S.," writing on the same subject, asks whether it would do to ring the trees (say) 2½ feet from the ground, as this would be less expensive than making the cuts very low down. In many cases I have known the ringing to be done at the height named, and the treatment thus applied has been quite effective; in fact no difference could be seen between those treated in this manner and those that were rung nearer the ground. —GEORGE VALDER.

EXPLOSIVES IN CLEARING LAND.—"W.M.": We are carrying out experiments with the various classes of explosives, but so far are unable to advise which is the most satisfactory to use. As far as we can judge at present, the majority of those on the market are satisfactory if used properly, and are safe if reasonable care is exercised.—GEORGE VALDER.

DETERMINATION OF BOTANICAL SPECIMENS.—"E.S." (Willow Tree): No. 1 is not a grass; it is part of a leaf of a *Xerotes* (*Liliaceæ*). Specimens should be sent for determination when they are in flower or in fruit.

No. 2 is *Acacia armata*, R.Br., "Kangaroo Wattle." It is common in all the Australian States except Tasmania. It is much cultivated, and makes excellent hedges.

No. 3 is *Diuris aurea*, Sm., belonging to the family *Orchideæ*.—J. H. MAIDEN.

Orchard Notes.

W. J. ALLEN.

OCTOBER.

Cover Crops.

WHERE green-manure crops have not already been turned in, this work should be finished as early as possible now, as there is always the chance of the season proving a dry one, in which event such crops would soon remove the moisture from the ground, and render it almost impossible to plough properly. Where the soil turns up lumpy and dry, the crop will not rot in the same way as it would were the ground in a good moist condition at time of ploughing.

Cultivation.

Throughout the spring and summer months, thorough cultivation should be given to orchards and vineyards; also after each rain the ground should be well worked to conserve as much moisture as possible, and prevent excessive evaporation. Under no circumstances should this important work be neglected. The soil around the base of all trees and vines should be loosened up to a good depth with a pronged hoe in the early spring, and occasionally during the summer, and any suckers found growing on either trees or vines should be removed.

Fighting Codlin Moth and other Pests.

Growers of apples and pears should spray their orchards systematically with arsenate of lead (commercial form) of approved brands, in order to protect the fruit from the ravages of codlin moth. It has been proved time and again that those who spray systematically, bandage, and pick up and destroy all fallen and infested fruit succeed in harvesting over 90 per cent. of clean fruit, while those who neglect spraying are lucky if they succeed in harvesting 40 per cent. of clean fruit.

Powdered forms of arsenate of lead are obtainable on the market. Some of our leading orchardists have given these a trial, and are more than pleased with the results. At the Bathurst Government Orchard, where one of these brands has been used, very good results have been secured.

To comply with the regulations under the Fruit Pest Act, it is necessary to attach the bandages to all apple, pear, and quince trees now, and those who fail to do so render themselves liable. It has been found that either a copper nail or a large shawl pin is the best and most simple means of fastening on the bandages.

Black Spot of the Apple and Pear.

It is now too late in most places for the winter dressing, which should be applied a few days before the trees burst into leaf and bloom. The second spraying should be given as soon as the fruit is well set, and may be used in conjunction with arsenate of lead. For the first application, before the tree bursts into bloom, the following solution may be used:—

Copper sulphate (bluestone)	6 lb.
Lime	6 lb.

made up with 22 gallons of water; while for the second spraying it may be diluted to 50 gallons.

Be careful to see the mixture is thoroughly prepared, and that it is not applied when the trees are wet or during rain, as we have found that russeting occurs if this precaution is not taken. In spraying, use as fine a nozzle as possible, and see that the whole of the tree, leaves, and fruit are covered.

Dormant Buds and Grafts.

Keep all worked stock well disbudded, never allowing suckers to grow where either bud or graft is doing well. If the stocks on which buds were inserted have not been cut back, this should be done without further delay.

The cut should be slanting, being slightly lower on the side opposite the bud, and it is advisable to stake them, not only to prevent their being blown out, but also to encourage a straight trunk.

Where grafts have been put in old trees, they must be tied to prevent their being blown off. To do this, a good stake should be tied to the branch grafted, and allowed to project a foot or more over the end; then as the graft grows, it can be tied to it.

Keep a strict watch on all refills and young trees, and if these show any signs of wilting, give them one or two buckets of water from time to time until they get a good start. Disbud all newly planted trees, leaving three or four good shoots, at least 4 inches apart, along the trunk of the tree. Do not allow two or three shoots to start from the same place, but give each branch a separate hold of the main stem. While working around trees, watch for borers on the trunks and branches, and it is very easy, when they are just starting their work, to cut away the bark and find them, thus keeping the orchard free of this pest.

Lime-Sulphur Spray for Peach-trees.

Commercial forms of concentrated lime-sulphur solutions suitable for summer spraying for Black Spot of the Apple and other fungous diseases may be purchased from Sydney merchants. The value of the concentrated mixtures is that they do not russet the fruit when applied during the summer months.

If it is decided to use the arsenate of lead and lime-sulphur combined, it is necessary to use great care, and do not add the arsenate of lead to the lime-sulphur solution until ready to commence spraying. Thorough agitation should be given when using the combined mixtures.

The following directions are given in Bulletin No. 2 of the Missouri State Board of Horticulture—"Spraying for the control of Peach Brown Rot and Scab," by W. M. Scott, Pathologist, United States Department of Agriculture:—

After petals drop, spray with 8·8·50 self-boiled lime-sulphur.

A month before the fruit ripens, spray with 8·8·50.

Preparation:—8 lb. fresh stone lime and 8 lb. of sulphur to 50 gallons of water.

Place the lime in a barrel, and pour on enough water to almost cover it. As soon as the lime begins to slake, add the sulphur, which should first be run through a sieve to break up the lumps. The mixture should be constantly stirred, and more water added as needed to form a thick paste at first, and then gradually a thin paste. The lime will supply enough heat to boil the mixture several minutes. As soon as it is well slaked, water should be added to cool the mixture and prevent further cooking. It is then ready to be strained into the spray tank, diluted and applied.

It is very important, especially with hot lime, to cool the mixture quickly by adding a few buckets of water as soon as the lumps of lime have slaked down. The intense heat, violent boiling, and constant stirring result in a uniform mixture of finely divided sulphur and lime, with only a very small percentage of sulphur in solution.

NOTE.—When making the lime-sulphur solution at the Government Orchards, we have found it necessary to cook the wash much longer than is recommended by Mr. Scott.

Department of Agriculture,
Sydney, 2nd October, 1912.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORNS.—* Royal Success: sire, Royal Hampton 10th (imp.); dam, Waratah; calved 10th October, 1910; colour, red. Price, **£30.**

Waratah is by Dora's Boy from Australian Pansy. Australian Pansy was by Airy Knight 2nd from Pansy 4th (imp.) Dora's Boy was by Cornish Boy (imp.), from Lady Dora (imp.)

Waratah yielded 5,305 lb. of milk last season, testing 3·6 per cent., or equal to 223 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter fat. Lady Dora (dam of Dora's Boy) gave 9,560 lb. of milk in 265 days.

This bull combines the successful Dora's Boy and Pansy blood.

Duke of Hampton: sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

GUERNSEYS.—King John: sire, King of the Roses (imp.); dam, Saucy Rose; calved 29th August, 1911; colour, lemon and white. Price, **£50.**

Saucy Rose is by Calm Prince from Rose Petal; she yielded 5,298 lb. milk with an average test of 5 per cent. butter-fat, or a butter production of 311 lb.

Belfast: sire, King of the Roses (imp.); dam, Flaxy 2nd; calved 20th September, 1911; colour, lemon and white. Price, **£40.**

Flaxy 2nd is by Rose Prince (imp.) from Flaxy (imp.). Flaxy (imp.) in thirty-seven weeks gave 6,443 lb. of milk, which it is estimated produced 334 lb. of butter. Flaxy 2nd developed a habit of sucking herself, and the only record shows 3,333 lb. of milk, testing 5 per cent.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Beaucaire's Baby: sire, Monsieur Beaucaire; dam, Rosey of Wollongbar; calved 28th March, 1911. Price, **£40.**

Confidence: sire, Royal Preel, by Itchen Preel from Hayes' Lily du Preel (imp.); dam, Faith, by Prince Souvia from Clatford Hopeful (imp.); calved 30th April, 1911. Price, **£45.**

H. C. L. ANDERSON, Under Secretary.

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* Applications for this bull will be held till 21st October, 1912. If more than one application be received, his disposal will be decided by ballot.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	....	....	Berry	*
Shorthorn	Pansy's Progress	Dora's Boy	Pansy 4th (im.)	Wollongbar Farm	*
,,	Imperialist	Florio	Lady Nancy of Minembah.	,, ,,	*
,,	March Pansy	Earl March	Australian Pansy	Grafton Farm	*
,,	Royal Pansy	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm	*
,,	Thessalian II.	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,,	Elaine's Heir	Thessalian II	Wagga Elaine	Yanco Farm	*
,,	Jamaica Jack	Sir Jack	Rum Omelette (imp.).	Wollongbar Farm	*
,,	Royal Blood	Berry Melbourne	Calceolus	,, ,,	*
,,	Xmas Fox (imp.)	Silver Fox	Malvoisie	Berry Farm	*
,,	Kaid of Khartoum	Sir Jack	Egyptian Belle	Cowra Farm	*
Guernsey	The King's Mirror	Calm Prince	Vivid (imp.)	Swan Bay	22 Dec., 12.
,,	Star Prince	Calm Prince	Vivid (imp.)	Kyogle	1 Feb., '13.
,,	Sky Pilot	Prince Souvia	Parson's Red Rose (imp.).	Maclean	15 Jan., '13.
,,	Prince Souvia	Vivid's Prince	Souvenir (imp.)	Grafton	1 April '13.
,,	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	H.A. College, Richmond	*
,,	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 April, '13.
,,	Sunshine	King of the Roses	Princess Vivid	Grafton Farm	*
,,	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,,	Claudius	Golden Star II.	Claudia's Pride (imp.).	Tweed River	12 Feb., '13
,,	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes	Berry Farm	*
,,	Good-bye	Western Duke	Souvenir (imp.)	Rous Mill	1 Nov., '12.
,,	The Peacemaker	Calm Prince	Rose Petersen	Jones' Island	1 June, '13.
,,	King of the Roses	Hayes' King	Rosey 8th (im.)	... .	23 April, '13
,,	Lauderlad	Laura's Boy	Souvenir of Wollongbar	Lismore	3 Jan., '13.
,,	Royal Preel	Itchen Royal	Hayes' Lily du Preel (imp.).	Murwillumbah	10 Nov., '12.
Ayrshire	Jamie's Heir	Jamie of Oakbank	Miss Prim	Wollongbar Farm.	*
,,	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose	Grafton Farm	*
,,	Orphan Boy	Songster of Greystanes.	Rosamond	Glen Innes Farm	*
,,	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry	Kildare II	Kildare (imp.)	Belvedere Bratha 3rd (imp.).	,, ,,	*
,,	Bratha's Boy	Aicme Chin (imp.)	Bratha 4th	,, ,,	*
,,	Rising Sun	Bratha's Boy	Dawn	Bathurst Farm	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1912.

Society.	Secretary.	Date.
Millthorpe P. and A. Association	R. H. French	Oct. 1, 2
Carcoar H., C., and A. Association	F. J. Brady	,, 16
Hillston P. and A. Association	S. J. Gordon	,, 16
Adelong P. and A. Association	A. W. Molineaux	,, 22, 23
Lismore A. and I. Society	T. M. Hewitt	Nov. 6, 7, 8
Tweed River A. Society	A. E. Budd	,, 13, 14
Mullumbimby A. Society	W. O. Davis	,, 27, 28

1913.

Albion Park A., H., and I. Association	M. A. Brown	Jan. 15, 16
Gosford and Brisbane Water A. and H. Association	R. J. Baker	,, 24, 25
Kiama A. Association	G. A. Somerville	,, 24, 25, 27
Kiama A. Association	G. A. Somerville	,, 25, 27
Wollongong A., H., and I. Association	M. A. O'Donnell	,, 30, 31, Feb. 1.
Berry A Association	C. W. Osborne	Feb. 5, 6
Alstonville A. Society	W. M. Monaghan	,, 11, 12
Tamworth P. and A. Association	J. R. Wood	,, 11, 12, 13
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 12, 13
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 13, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	,, 18, 19, 20
Cobargo A., P., and H. Society	T. Kennelly	,, 19, 20
Wyong A. Association	J. H. Kay	,, 20, 21, 22
Central Cumberland A. and H. Association	H. A. Best	,, 21, 22
Dapto A. and H. Society	J. H. Lindsay	,, 25, 26
Campbelltown A. Society	F. Sheather	,, 26, 27
Gulgong A. and P. Association	D. H. Spring	,, 26, 27
Gunning P., A., and I. Society	J. R. Turner	,, 26, 27
Manning River A. and H. Association (Taree)	S. Whitbread	,, 26, 27
Tumut A. and P. Association	T. E. Wilkinson	,, 26, 27
Armidale and New England P., A., and H. Assoctn.	A. McArthur	,, 26-28
Inverell P. and A. Association	J. McIlveen	,, 26, 27, 28
Northern A. Association (Singleton)	E. J. Dann	,, 27, 28, Mar. 1.
Southern New England P. and A. Association, Uralla.	W. McCrossin	Mar. 4, 5
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 4, 5, 6
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 4, 5, 6
Bega A., P., and H. Society	W. A. Zingel	,, 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Camden A., H., and I. Society	A. Thompson	,, 5, 6, 7
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 5, 6, 7
Newcastle A., H., and I. Association	C. W. Donnelly	,, 5, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 6, 7
Nepean District A., H., and I. Society (Penrith)	P. J. Smith	,, 6, 7
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge	,, 11, 12, 13
Bombala A. Society	W. G. Tweedie	,, 12, 13
Molong P. and A. Association	W. J. Windred	,, 12
Macleay A., H., and I. Association	E. Weeks	,, 12, 13, 14
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 12, 13, 14
Goulburn A., P., and H. Society	G. G. Harris	,, 13, 14, 15
Gundagai A. Society	A. Elworthy	,, 18, 19
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 26, 27

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VOL. XXIII. PART 11. NOVEMBER 2, 1912.

Agricultural Gazette of New South Wales.

Third Annual Report of the Demonstration Area, Bathurst Experiment Farm, 1911.

R. W. PEACOCK, Manager.

I HAVE pleasure in submitting the Third Annual Report of the Demonstration Area of this Farm. A profit is again shown; namely, £1 18s. 3d. per acre. The profits per acre for each of the three last years have been as follow :—

Year.	Profit per acre. £	s.	d.
1909	1	8	8¼
1910	1	3	3
1911	1	18	3

The profit shown for 1911 was very satisfactory, and was in no small measure due to the increased value of produce, owing to the drought of the early half of 1912. As a set-off against this, considerable losses were occasioned by storms at harvest time, which reduced the yields of grain by 5 to 6 bushels per acre ; there was also a loss of a straw-stack by fire. A detailed report of the crops was published in the *Agricultural Gazette* for May, 1912.

Besides the profit shown, it should be borne in mind that if the work had been performed by a farmer and his sons, they would have received, in addition, full wages for all the work they performed, which would represent a living.

In this report, results have been presented in three different ways, viz. :—

1. The actual expenditure and receipts, as during previous years, showing the profit as above.

2. A statement based upon the average local rates for the work done, the produce sold at local milling rates, and the value of the fodder crops estimated to cover the cost of their production only ; the profit on this basis being £2 1s. 4½d. per acre.

3. A statement based upon local rates, plus cost of grading of seed, &c., and the seed sold as pure seed to farmers ; in this case the profit is £2 10s. 5½d. per acre.

As regards rent, in the two latter statements a period of eight months is charged for in the case of the fodder crops, and a period of sixteen months against the main cereal crops ; the longer period representing the five months fallow preceding the wheat crop, as well as its growing period.

The low returns from the fodder crops in statement No. 1 were due to the increased cost of production as against previous years. The land received two 4-inch ploughings, and owing to the Farm being overstocked, the sheep were turned into the young fodder crops too soon, and much of the barley was pulled out by the roots at the first grazing, leaving only about half a stand for subsequent grazings.

For a detailed statement of the conditions governing the Demonstration Area, those interested are referred to the previous Annual Reports.

STATEMENT No. 1.

Paddock No. 1.

Rape and Barley Fodder Crop.

Area, 14·32 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
First ploughing	3	2	1	Agistment—3 sheep per acre for five months; fodder valued at 10s. per acre ...	7	3	2
Second do	2	14	11½				
Sowing	1	4	9				
Seed—249 lb. Cape barley ...	1	5	0				
49 lb. rape	0	12	11				
Manure—7¼ cwt. superphosphate	1	15	4				
Rent, 14·32 acres	5	19	4				
Cutting weeds	0	12	0½	Balance...	10	3	3
	£17	6	5		£17	6	5

Paddock No. 1A.

Rape and Barley Fodder Crop.

Area, 7·19 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
First ploughing...	1	1	9	Agistment—2·68 sheep per acre for five months; fodder valued at 8s. 11d. per acre...	3	4	2
Second do	1	11	5½				
Sowing	0	13	6				
Seed—121 lb. Cape barley ..	0	12	0				
23 lb. rape	0	6	1				
Manure—3½ cwt. superphosphate	0	17	1				
Rent, 7·19 acres	2	19	11	Balance	4	17	7
	£8	1	9		£8	1	9

Paddock No. 2.

Rape and Barley Fodder Crop.

Area, 30·97 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
First ploughing...	5	1	5	Agistment—2·69 sheep per acre for five months; fodder value, 9s. per acre	13	18	9
Second do	4	12	8				
Sowing	2	8	9				
Seed—498 lb. Cape barley ...	2	10	0				
85 lb. rape	1	2	5				
Superphosphate, 16 cwt. ...	3	18	1				
Rent, 30·97 acres	10	4	8	Balance	15	19	3
	£29	18	0		£29	18	0

Paddock No. 2a.

Rape and Barley Fodder Crop.

Area, 15·36 acres.

Dr.	£	s.	d.	Cr.	£	s.	d.
First ploughing..	4	7	5	Agistment—2·31 sheep per acre for five months; fodder value, 7s. 8d. per acre ...	5	18	3
Second do	2	18	11				
Sowing	1	9	3				
Seed—300 lb. Cape barley ..	1	10	0				
47 lb. rape	0	12	5				
Superphosphate, 8¾ cwt. ..	2	2	8				
Rent, 15·36 acres	6	8	0	Balance	13	10	5
	£19	8	8		£19	8	8

Paddock No. 5.

Bobs and John Brown Wheat for Hay.

Area, 10·39 acres.

Dr.	£	s.	d.	Cr.	£	s.	d.
First ploughing...	2	9	9	Agistment	4	15	7
Second do	3	19	11	Hay—12 tons 5 cwt. 18 lb., at £4 8s. 0d. per ton	53	18	0
Sowing	0	19	6				
Seed—5 bus. 19 lb. wheat ...	1	11	11				
Superphosphate—397 lb. ...	0	17	3				
Cutting hay	1	16	7				
Stooking..	0	11	0				
Carting to stack	2	17	6				
Rent	4	6	7				
Balance	39	3	7				
	£58	13	7		£58	13	7

Paddock No. 6.

Bobs and Cleveland Wheat.

Area, 24·9 acres.

Dr.	£	s.	d.	Cr.	£	s.	d.
First ploughing...	7	15	5	Agistment	6	4	6
Second do	3	16	0½	Hay—			
Third do	4	9	2½	28 tons 13 cwt. 2 qrs. 6 lb., at £4 18s. per ton	140	10	4
Sowing	1	16	0	1 ton 16¼ cwt., at £4 13s. 0d.	8	8	7
Seed wheat—12 bus. 4 lb. ...	3	12	5	Straw—			
Superphosphate—636 lb. ...	1	6	6	5 tons 6¼ cwt., at £3 6s. ...	17	10	8
Harrowing portion of crop ...	0	7	1½	Cleveland wheat—			
Cutting hay	3	11	9½	81 bus., at 6s.	24	6	0
Stooking hay	1	13	2¼	16¾ bus., at 4s. 1d.	3	8	5
Carting and stacking	6	12	2	4 bus. 40 lb., at 2s. 6d. ...	0	11	8
Covering haystack	0	5	5¾	Bobs wheat—			
Restooking	0	10	4½	74½ bus., at 6s.	22	7	0
Cutting wheat for grain ..	2	7	4¼	9¾ bus., at 4s. 1d.	1	19	10
Stooking	1	3	1½	1½ bus., at 2s. 6d.	0	3	9
Restooking	0	7	1¼	15 bus., at 3s. 5d.	2	11	3
Carting and stacking	3	18	0¼				
Thatching haystack	0	17	0				
Threshing	8	17	2¾				
Cartage to barn	1	0	3½				
Recleaning	0	13	0				
Grading	2	4	4				
Wheat bags	1	9	6				
Cartage to rail	0	6	6				
Rent—24·9 acres	10	7	6				
Balance	158	15	4				
	£228	2	0		£228	2	0

Paddock No. 10.

Cape Barley for Green Fodder.

Area, 10·2 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Ploughing	1	5	6½	By agistment—1·95 sheep per acre for five months	3	6	4
Sowing	1	1	0½	Half profit maize crop, brought forward from previous report	5	12	7
Cape barley—260 lb.	1	6	0	Balance	0	0	7
Superphosphate—4½ cwt.	1	1	11				
Rent—10·2 acres	4	5	0				
	£8	19	6		£8	19	6

Paddock No. 11.

Cleveland Wheat for Grain.

Area, 31·32 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
First ploughing	15	1	6½	By agistment	1	13	11
Second do	5	1	5	Straw—			
Third do	8	6	0	11 tons 5½ cwt., at £3 6s.	37	4	2
Sowing	2	7	3	Hay—			
Seed wheat—14 bus. 6 lb.	4	4	7	4 tons 4 cwt., at £4 18s.	20	11	7
Superphosphate—108 lb.	0	4	8	Wheat—			
Removing stray plants	1	4	1	639½ bus., at 6s.	191	17	0
Cutting headlands	0	12	2¼	21 bus., at 5s.	5	5	0
Stooking	0	7	9½	99¼ bus., at 4s. 1d.	20	5	3
Restooking	0	0	10	12¼ bus., at 2s. 6d.	1	10	7
Carting and stacking	1	10	5½				
Cutting crop for grain	7	17	3¼				
Stooking	2	3	7				
Carting and stacking	13	7	9				
Covering stack	0	4	1½				
Threshing	25	13	8				
Cartage to barn	1	0	3				
Thatching strawstack	2	1	8				
Recleaning	2	0	8¾				
Grading	6	12	9				
Wheat bags	5	8	10				
Cartage to rail	1	6	8				
Treatment of seed wheat	0	4	1				
Rent—31·32 acres	13	1	0				
Balance	158	4	4				
	£278	7	6		£278	7	6

In addition to the straw shown above, the paddock produced a stack of straw, weighing approximately 14¼ tons, and valued at £47, which was accidentally destroyed by fire.

Paddock No. 12.

Federation and Bayah Wheat for Grain.

Area, 28·25 acres.

Dr.	£	s.	d.
First ploughing...	11	17	4
Second do	4	14	0
Third do	5	13	4
Sowing ...	2	5	0
Seed wheat—13 bus. 9 lb.	3	18	11
Harrowing	0	17	4¼
Removing stray plants	0	14	2
Cutting headlands for hay	0	9	6
Stooking ..	0	4	2
Carting hay to stack ...	0	13	11
Cutting for grain	5	15	6¼
Stooking...	1	14	0¼
Carting and stacking	6	8	10½
Covering stack ...	0	3	11
Threshing	18	6	10¾
Cartage to barn...	0	14	7
Recleaning	1	9	4¾
Grading ...	4	0	6
Wheat bags	3	12	2
Cartage to rail ...	0	16	8
Treatment of seed wheat	0	3	10
Thatching strawstack	1	10	8¼
Rent—28·25 acres	11	15	5
Balance ...	103	10	4
	£191	10	6

Cr.	£	s.	d.
Agistment—55 sheep per acre for five months, fodder value 1s. 8d. per acre	2	4	2
Wheat—			
400 bus. 10 lb., at 6s. ...	120	1	0
73 bus., at 4s. 1d.	14	18	2
9 bus., at 4s.	1	16	0
31 bus., at 3s. 5d.	5	6	9
12 bus., at 2s. 6d.	1	10	0
Straw—			
11 tons 13 cwt. 3 qrs. 17 lb., at £3 6s. per ton	38	11	4
Hay—			
1 ton 9 cwt. 22 lb., at £4 18s. per ton	7	3	1
	£191	10	6

Depreciation and Interest Account.

	£	s.	d.
Capital value of plant	798	15	0
Depreciation, at 10 per cent.	79	17	6
Interest, at 5 per cent.	39	18	9

As this plant is used on other sections of the Farm, the total of depreciation and interest is reduced by half, and the amounts charged against the Demonstration Area are therefore :—

	£	s.	d.
Depreciation	39	18	9
Interest	19	19	5

Summary of Profit and Loss.

Paddock	Loss. £	s.	d.	Profit. £	s	d.
No. 1, Rape and barley	10	3	3	....		
,, 1A, ,,	4	17	7	....		
,, 2, ,,	15	19	3	....		
,, 2A, ,,	13	10	5	....		
,, 5, Bobs and John Brown wheat for hay	. ....			39	3	7
,, 6, Bobs and Cleveland wheat for hay and grain	... .			158	15	4
,, 10, Maize for grain, and barley for green feed	0	0	7	....		
,, 11, Cleveland wheat for grain ...	.. ..			158	4	4
,, 12, Federation and Bayah wheat for grain ...	... . ..			103	10	4
Tending stock ...	10	0	0	....		
Depreciation on plant	39	18	9	....		
Interest on cost of plant	19	19	5	. ...		
Balance, being net profit	345	4	4			
	£459	13	7	£459	13	7

Net profit : £1 18s. 3d. per acre.

STATEMENTS NOS. 2 AND 3.

STATEMENT of operations for the year 1911, based on estimated average local rates.

The charges for the various operations have been fixed as follow :—

Six-inch ploughing	7s. per acre.
Four-inch ploughing	4s. ,,
Drilling	2s. ,,
Seed wheat	6s. per bushel.
,, barley	5s. ,,
,, rape	3d. per lb.
Superphosphate	£4 17s. 7d. per ton.
Cutting with binder	4s. per acre.
Twine	1s. 6d. per acre.
Stooking	1s. 6d. ,,
Carting and stacking	7s. 6d. ,,
Threshing	5½d. per bushel.
Bags and twine	2d. ,,
Recleaning and grading	4d. ,,
Rent	8s. 4d. per acre.

The agistment from the fodder crops is valued at the cost of their production.

Paddock No. 1.

Rape and Barley Fodder Crop.

Area, 14·32 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Two 4-inch ploughings ...	5	14	6	By agistment...	14	15	8
Drilling	1	8	7				
Seed—249 lb. Cape barley ...	1	5	0				
,, 49 lb. rape	0	12	11				
7¼ cwt. superphosphate ...	1	15	4				
Rent, 8 months...	3	19	4				
	£14	15	8		£14	15	8

Paddock No. 1a.

Rape and Barley Fodder Crop.

Area, 7·19 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Two 4-inch ploughings ...	2	17	6	By agistment...	7	7	0
Drilling	0	14	5				
Seed—121 lb. Cape barley ...	0	12	0				
,, 23 lb. rape	0	6	1				
Superphosphate, 3½ cwt. ...	0	17	1				
Rent, 8 months...	1	19	11				
	£7	7	0		£7	7	0

Paddock No. 2.

Rape and Barley Fodder Crop.

Area, 30·97 acres.

Dr.	£	s.	d.	*Cr.*			
Two 4-inch ploughings ...	12	7	10	By agistment	29	16	9
Drilling	3	2	0				
Seed—498 lb. Cape barley ...	2	10	0				
,, 85 lb. rape	1	2	5				
Superphosphate, 16 cwt. ...	3	18	1				
Rent	6	16	5				
	£29	16	9		£29	16	9

Paddock No. 2a.

Rape and Barley Fodder Crop.

Area, 15·36 acres.

Dr.	£	s.	d.	*Cr.*	£	.	d.
Two 4-inch ploughings ..	6	2	10	By agistment	16	4	0
Drilling	1	10	9				
Seed—300 lb. Cape barley ..	1	10	0				
,, 47 lb. rape	0	12	5				
Superphosphate, 8¾ cwt. ..	2	2	8				
Rent	4	5	4				
	£16	4	0		£16	4	0

Paddock No. 5.

Bobs and John Brown Wheat for Hay.

Area, 10·39 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Six inch ploughing	3	12	9	By agistment	4	15	7
Four-inch do	2	1	7	Hay—			
Treatment of seed wheat ..	0	1	7	12 tons 5 cwt. 18 lb., at £4 8s.			
Seed wheat, 5 bus. 19 lb. ..	1	11	11	per ton	53	18	0
Superphosphate, 397 lb. .	0	17	3				
Drilling	1	0	9				
Cutting with binder	2	1	7				
Twine	0	15	7				
Stooking...	0	15	7				
Carting and stacking	3	17	11				
Rent, 12 months	4	6	7				
Balance	37	10	6				
	£58	13	7		£58	13	7

Paddock No. 6.

Bobs and Cleveland Wheat.

Area, 24·9 acres.

Dr.

	£	s.	d.
Six-inch ploughing	8	14	4
Two 4-inch ploughings ...	9	19	2
Treatment of seed .. .	0	3	6
Seed wheat, 12 bus. 4 lb. ...	3	12	5
Superphosphate, 636 lb. ...	1	6	6
Drilling	2	9	10
Harrowing part of crop ...	0	7	1
Cutting with binder	4	19	7
Twine	1	17	4
Stooking...	1	17	4
Carting and stacking	9	6	9
Threshing (202 bus.)	4	12	10
Bags and twine..	1	13	9
Cartage to rail	0	8	5
Thatching stack	0	17	0
Rent, 16 months	13	16	5
Balance	147	18	8
	£214	0	11

Cr.

	£	s.	d.
By agistment	6	4	6
Hay—			
28 tons 13 cwt. 2 qrs. 6 lb. at £4 18s.	140	10	4
1 ton 16 cwt. 1 qr., at £4 13s.	8	8	7
Straw—			
5 tons 6¼ cwt., at £3 6s. ..	17	10	8
Wheat—			
202½ bus., at 4s. 1d. ..	41	6	10
	£214	0	11

The difference when the crop is saved for the production of pure seed wheat is shown by the following figures for Statement No. 3 :—

	£	s.	d.
Expenses as above . ..	66	2	3
Cartage to barn	1	0	3
Recleaning and grading ..	3	7	6
Balance	157	10	3
	£228	0	3

	£	s.	d.
By agistment, hay, and straw.	172	14	1
Wheat, 155½ bus. at 6s ; 26½ bus. at 4s. 1d.; 15 bus. at 3s. 5d.; 5½ bus. at 2s. 6d ..	55	6	2
	£228	0	3

Paddock No. 10.

Barley Fodder Crop after Maize.

Area, 10·2 acres.

Dr.

	£	s.	d.
Four-inch ploughing	2	0	10
Cape barley, 260 lb. . ..	1	6	0
Superphosphate, 4½ cwt .	1	1	11
Drilling	2	0	10
Rent, 12 months . .	4	5	0
	£10	14	7

Cr.

	£	s.	d.
By half profit on maize (previous crop)...	5	12	7
Agistment	5	2	0
	£10	14	7

Paddock No. 11.

Cleveland Wheat for Grain.

Dr. Area, 31·32 acres. *Cr.*

	£	s.	d.		£	s.	d.
Six-inch ploughing	10	19	3	By 772 bus. wheat, at 4s. 1d.	157	12	4
Two 4-inch ploughings	12	10	6	Straw—			
Drilling	3	2	8	11 tons 5½ cwt., at £3 6s.	37	4	2
Treating seed wheat	0	4	1	Hay—			
Seed wheat, 14 bus. 6 lb.	4	4	7	4 tons 4 cwt., at £4 18s.	20	11	7
Superphosphate, 108 lb.	0	4	8	Agistment	1	13	11
Cutting with binder	6	5	3				
Twine	2	6	11				
Stooking	2	6	11				
Carting and stacking	11	14	11				
Threshing (772 bus.)	17	13	10				
Bags and twine	6	8	8				
Cartage to rail	1	12	2				
Thatching stack	2	1	8				
Rent, 16 months	17	8	0				
Balance	117	17	11				
	£217	2	0		£217	2	0

A stack containing approximately 14¼ tons of straw was accidentally destroyed by fire. The value of this straw was estimated at £47.

The difference when the crop is saved for the production of pure seed is as follows for Statement No. 3:—

	£	s.	d.		£	s.	d.
Expenses as above	99	4	1	By hay, straw, and agistment	59	7	8
Removing stray plants	1	4	1	Wheat—			
Cartage to barn	1	0	3	639½ bus., at 6s.; 21 bus. at 5s.; 99¼ bus., at 4s. 1d.; 12¼ bus., at 2s. 6d.	218	17	10
Recleaning and grading	12	17	4				
Balance	163	19	9				
	£278	5	6		£278	5	6

Paddock No. 12.

Federation and Bayah Wheat.

Dr. Area: 28·25 acres. *Cr.*

	£	s.	d.		£	s.	d.
Six-inch ploughing	9	17	9	By agistment	2	4	2
Two 4-inch ploughings	11	6	0	Hay—			
Treatment of seed	0	3	10	29 cwt. 22 lb. at £4 18s. per ton	7	3	1
Seed wheat, 13 bus. 9 lb.	3	18	11	Straw—			
Drilling	2	16	6	11 tons 13 cwt. 3 qrs. 17 lb. at £3 6s. per ton	38	11	4
Cutting with binder	5	13	0	Wheat—			
Twine	2	2	5	525 bus., at 4s. 1d.	107	3	9
Stooking	2	2	5				
Harrowing	0	17	4				
Carting and stacking	10	11	11				
Threshing (525 bus.)	12	0	8				
Cartage to rail	1	1	10				
Thatching stack	1	14	7				
Bags	4	7	6				
Rent, 16 months	15	13	10				
Balance	70	13	10				
	£155	2	4		£155	2	4

The additional receipts and expenditure when the crop is saved for sale as pure seed are as follow, for Statement No. 3 :—

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Expenses as above	84	3	6	By agistment, hay and straw	47	18	7
Removing stray plants ...	0	14	2	Wheat—			
Cartage to barn	0	14	7	400 bus. at 6s.; 73 bus. at 4s. 1d.; 9 bus. at 4s.; 31 bus. at 3s. 5d.; 12 bus. at 2s. 6d.	143	10	0
Recleaning and grading ...	8	15	0				
Balance	97	1	4				
	£191	8	7		£191	8	7

Statement of Profit from each Paddock.

Paddock.	Statement No. 2. Wheat sold at milling rates.			Statement No. 3. Wheat sold as pure seed.		
	£	s.	d.	£	s.	d.
1	...	...	...	...	...	...
1A	...	...	...	...	...	...
2	...	...	...	...	...	...
2A	...	...	...	...	...	...
5 (sold as hay)	37	10	6	37	10	6
6	147	18	8	157	10	3
10	...	...	...	...	...	...
11	117	17	11	163	19	9
12	70	13	10	97	1	4
	£374	0	11	£456	1	10
Average per acre (whole area)	£2	1	4½	£2	10	5½
Average per acre for 94·86 acres of wheat	£3	18	10¼	£4	16	1¾

EFFECT OF FALLOWING UPON NITRATES IN THE SOIL.

THE fact that our wheat lands do not require the application of costly nitrogenous manures, thus differing from the lands of Europe, is well known. In the September number of the Victorian *Journal of Agriculture*, Mr. A. E. V. Richardson, M.A., B.Sc., gives the various causes which are accepted as contributing to this result, and incidentally mentions that fallowing causes nitrification to proceed at a very rapid rate. Experiments at Longerenong Agricultural College showed that in January, 1912, a fallowed plot contained 4·6 parts per million of nitrate nitrogen in the first five feet of soil; and a non-fallowed plot, 2·18 parts. The difference became accentuated as time went on, until, on the 7th August, the fallowed land (then under crop) contained 5·12 parts as against 1·28 parts in the non-fallowed land. In the fallowed land there was, at seeding time, 4½ times more available nitrogen than would be required for a fifteen-bushel crop, whilst in the non-fallowed plot there was barely enough for a fifteen-bushel crop.

Effect of Bleaching on Wheat.

F. B. GUTHRIE AND G. W. NORRIS.

IN order to test the nature of the damage done to grain from the milling point of view by bleaching, the Parkes Branch of the Farmers and Settlers' Association forwarded samples of bleached and unbleached wheats harvested last season as follows:—

1.	Federation	unbleached.
2.	„	bleached.
3.	Jade	unbleached.
4.	„	bleached.
5.	Rymer	„
6.	Federation	„
7.	„	„
8.	Jonathan	„
9.	Steinwedel	unbleached.

In the case of the first two pairs, Nos. 1 and 2 and Nos. 3 and 4, the samples were taken from the same crop in each case. The unbleached samples of Federation and Jade were harvested at the end of November, 1911, Rain then fell and the remainder of the crop received 7¼ inches of rain during the last week of November and the first week of December. The rest of the crop was harvested a few days after.

These two pairs provide, therefore, a very good test of the action of bleaching agencies under normal conditions, and a comparison of their behaviour in the mill affords a very fair indication of the usual effects of bleaching upon milling quality. The results obtained are given in Table A.

Apart from the colour and appearance of the grain, the difference in which is very marked, and to the disadvantage of the bleached grain, the chief difference is in the bushel weight, which is lower in the case of the bleached sample of Federation by 5 lb. per bushel, and in the case of Jade by 3¾ lb. This is a very serious deficiency, and affects the commercial value of the sample considerably.

There is less difference than one might be led to expect in the actual behaviour of the samples in the mill. The bran from the bleached sample was in both cases thicker and broader, and, as the figures show, rather greater in quantity than from the unbleached. The colour of the flour appears to be practically unaffected; indeed, the unbleached sample of Jade gives a flour of a lighter colour than does the bleached, which may be due to the fact that the unbleached sample of Jade was harvested somewhat on the "green" side.

The gluten-contents are, however, lower in the bleached grain. In the case of the Federation sample the deterioration in this respect is considerable.

Summing up, the effects of bleaching are to affect the appearance and colour of the grain, to lower the bushel-weight considerably, and to diminish the gluten-content of the flour. The most serious of these results, from the miller's point of view, is the lowering of the weight per bushel, and this is a defect that seriously reduces the market value of the bleached grain.

Results obtained from the other samples submitted by the Parkes Branch of the Association are given in Table B. In none of these cases was there a corresponding bleached or unbleached sample for comparison, and no conclusions can be drawn from these figures. The sample of Steinwedel showed signs of weathering. In all cases, except that of Jonathan, which always yields a small bran, the brans were broad and thick. The bushel-weights are all much lower than those of the unbleached samples of Jade and Federation quoted in the previous table.

Some time ago, in order to test the effect of bleaching on grain, we exposed a sample of Bobs wheat during a showery week to the alternate action of sun and rain for six days. The original sample had a bushel-weight of 64½ lb. The same sample, after bleaching, weighed only 54¾ lb. per bushel, having suffered a loss in weight of 9¾ lb. This is, of course, an exceptional case, as the conditions were purposely made very severe.

THE ORIGIN OF DRY FARMING.

THE following is a translation of some comments on Dr. J. A. Widstoe's "Dry Farming," published in the *Bulletin Agricole de l'Algérie et de la Tunisie*, under the heading "Dry Farming in Algeria and Tunis," by F. Couston :—

> Just one word on the paragraph referring to Jethro Tull in the chapter dealing with the history of Dry Farming
>
> It is a curious fact that 200 years ago this English agriculturist devised a system of cultivation for application in his own country based on the Bourdiol method of cultivation, exactly as it is recommended to-day for our dry climate.
>
> The first idea of his method came to him, says Widstoe, during a journey which he made to Languedoc in France. It was there that he learned the necessity for continuous working of the soil.
>
> Our own master, Deherain, loved to relate the following anecdote in his advice to us on the good effects of repeatedly working over the surface :—
>
> Travelling also in Languedoc, he came across an old vigneron one day in the middle of August, who was occupied in digging over his vineyard again with great care, although the soil there was perfectly loose and free from weeds. Puzzled to know the reason for the laborious toil which the old man had imposed on himself, and which appeared at least useless and unnecessary, he asked him. In that tone of conviction which comes from long experience, the vigneron answered : "It always makes the grapes grow a little bigger."
>
> In spite of its Anglo-Saxon appearance, Dry Farming has come directly from the genius of the French.

TABLE A.—Comparison of Bleached and Unbleached Wheats.

Wheat.	Appearance of Grain.	Bushel Weight.	Percentage of Mill Products.			Nature of Flour.		
			Flour.	Pollard.	Bran.	Colour of Flour.	Absorption of water—quarts per 200 lb.	Gluten.
		lb.	per cent	per cent	per cent.			per cent.
1. Federation (unbleached) ..	Amber colour, soft, plump, medium size	65·1	69·3	15·2	15·5	Excellent; yellow tinge.	46·0	13·5
2. Federation (bleached) ..	Dull white, bleached, fairly plump, soft, medium size.	60·1	70·5	13·7	15·9	Excellent; lighter than No. 1 Federation.	45·6	10·7
3. Jade (unbleached) ...	Dark amber colour, plump, soft, fairly large.	64·1	70·9	14·9	14·2	Excellent; rather lighter than No. 4 Jade.	47·4	15·3
4. Jade (bleached)	Dark white, bleached, plump, soft, small	60·4	70·3	13·8	15·9	Excellent	47·6	14·0

TABLE B.—Analyses of other Wheat Samples.

Wheat.	Appearance of Grain.	Weight per Bushel.	Percentage of Mill Products.			Nature of Flour.		
			Flour	Pollard.	Bran.	Colour of Flour.	Absorption of water—quarts per 200 lb.	Gluten.
		lb.	per cent.	per cent.	per cent.			per cent.
Rymer (bleached	Dull white, soft, fairly plump, fair size	60·4	69·0	16·9	14·1	Excellent	48·0	16·8
Federation (bleached) ..	Dull white, soft, plump, medium size	61·0	69·2	16·3	14·5	Excellent	45·8	14·7
Federation (bleached) ...	Dull white, rather pinched, medium size	60·9	70·1	16·6	13·3	Excellent ...	45·0	12·7
Jonathan (bleached) ...	Dull white, small, plump, hard	62·2	72·1	14·9	13·0	Excellent ...	50·6	12·9
Steinwedel (unbleached) ...	Dull white, large, plump, slightly weathered.	61·5	67·8	16·1	16·1	Good	45·8	11·3

"Take-all" in Wheat.

[NOTE.—A farmer in the Quirindi district recently submitted specimens of wheat plants attacked by this disease. The following report was furnished by the Bureau of Microbiology, and should interest other farmers.—ED.]

THE wheat plants from Quirindi are apparently attacked by "Take-all" fungus (*Ophiobolus graminis*, Sacc.). The butts of the stem, crown and roots are blackened, and the tissues dead or dying throughout. Fungus threads are very numerous in the sheaths of the leaves; the leaves are sickly yellow, and the plant is dying from below upwards. No spores were obtained, but the presence of the mycelium, and the appearances of the young plants, almost certainly indicate "Take-all." The general symptoms* are given below more fully to aid the grower to better identify the disease, and the treatment* now recommended and largely followed, especially in South Australia, where "Take-all" is often very serious, is also given. We would be pleased to hear further about these patches, to receive further specimens in different stages of growth, and to follow the results of the treatment.

Symptoms.

If the disease is followed from its earliest appearances, it will be seen that plants succumb at various stages of growth, according to the time and severity of the attack, the nature of the season, and the condition of the plants themselves.

In some spots or patches where the fungus is prevalent, and the young plants are attacked early, the disease may appear before the formation of the stalk. The plants assume a sickly appearance, having lost their dark-green colour, their leaves turn yellow, and soon they shrivel up and die. Again, the attack may be later, or the plants are better able to withstand the fungus, and so they linger on longer, but ultimately die. The fungus spreads from a centre, attacking the plants in its vicinity, and so dead patches occur here and there throughout the crop, to which patches the name of "Take-all" is given. It is quite common for the wheat plant to produce its ears and look as if it were going to fill them, but suddenly, as it were, they become bleached as if prematurely ripe, and the plant dies from the root upwards. Every gradation has been met with from the "Take-all," in which the plants died young, to the "White-heads," in which the ears consisted of mere empty husks, or, if the grain is formed, it soon shrivelled and did not come to maturity. In some soils, especially rather firm sandy loams, the early destruction of the plants is hardly so noticeable as on loose friable soils, and the plants seem better able to withstand the fungus for a time at least, and when they do succumb, it is only after the ears have begun to appear.

**Journal of Agric., S. Aust.*, Dec., 1910, Mr. A. E. V. Richardson; *Journal of Agric., Victoria*, Vol. 2, 1904, Mr. McAlpine.

If the dead or dying plants are closely examined at the root, they will be found more or less blackened at the butt; hence the name given this disease in France is "Foot-rot" or "Black-leg." If such plants are pulled, it will be found that the roots break off short, leaving only a short, densely hairy, and swollen portion attached to the stem. It often occurred that new roots had been given off by the stem above the diseased portion, and they were sometimes able to prolong the life of the plant, but sooner or later they became unequal to the task of keeping up the supply of food, and so death ensued.

The disease thrives on barley grass (*Hordeum murinum*), spear grass (*Bromus sterilis*), and on barley.

Treatment.

Owing to the rapidity of development of the disease, and because it is only observed after the fungus has made considerable progress, little can be done to cure the disease directly. Much might be done, however, by way of prevention of the disease, directly by destroying the spores, and indirectly by starving out the fungus. Applications of iron sulphate, copper sulphate, liver of sulphur, and corrosive sublimate have been used more or less successfully. Theoretically, it might be expected that burning the stubble does much to mitigate the disease by actually destroying large numbers of spores; and in practice it is found that, wherever there has been a good stubble burn, the resultant crops are free from "Take-all." Many spores are on underground parts of the stems and roots, and so we must not be too sanguine of success.

The most practical method of prevention would appear to be a resort to the method of starving out the fungus. It cannot live on the oat plant. The farmer suffering badly from "Take-all" is earnestly advised to fallow early next season, keep down by cultivation the plants or weeds that may act as a host for the parasite, and substitute a crop of oats in place of the usual wheat crop. The spores left in the soil from the diseased wheat crops are encouraged to germinate by the process of fallowing, and if the fallow be kept free from possible host plants, the spores that germinate die out. A great many spores will pass through the season without germinating, but would possibly be encouraged to germinate in the succeeding year. The oat crop now occupying the land does not act as a host, and the spores that have germinated necessarily perish. If, then, the land is fallowed up again after the oat crop is reaped, and wheat is sown after the fallow, it is reasonably certain that the "Take-all" on that particular section will have been eliminated.

Rotation.

1912 (1) Wheat (badly attacked by "Take-all").
1913 (2) Early and well prepared fallow.
1914 (3) Oats.
1915 (4) Early fallow.
1916 (5) Wheat.

This rotation might, of course, be modified as follows:—

(1) Wheat.
(2) Early fallow.
(3) Oats (grazed).
(4) Oats (sown on stubble land for reaping).
(5) Fallow.
(6) Wheat.

The principle underlying all preventive measures, however, is exceedingly simple. It consists of starving out the fungus:—

(1) By inclusion of an oat crop in the rotation;
(2) By preventing any host plants from growing on the fallows.

The principle may be modified by each individual farmer to suit the exigencies of his local conditions.

SUBSOILING WITH EXPLOSIVES AT WENTWORTH.

MR. C. W. BURBURY, Superintendent of the Wentworth Irrigation Area, reports that a demonstration in subsoiling with explosives was given on the area on 9th August last, by a representative of Messrs. Dalgety & Co., the explosive used being Monobel powder. There is a hardpan on the area, averaging from 6 to 8 inches in thickness, but extending in places to a depth of 2 feet 6 inches.

In one place, where the hardpan extends to about 2 feet, a hole was put down 12 inches, and one plug of Monobel exploded. This just blew out the earth and left a hole the size of a hole that would be dug out for planting a young tree, at the same time shattering the ground all round for about 12 inches. The next plug was put down 18 inches; this threw out very little earth, but the earth was cracked for about 2 feet 6 inches all round the hole, and left fairly loose. Another similar charge put down 2 feet, just near the bottom of the hardpan, seemed to do very good work. The whole surface for about 6 feet in diameter was seen to rise up several inches, and Mr. Burbury pushed the handle of a shovel down about 2 feet 6 inches, near the centre of the hole, without any trouble. The next charge was put down about 2 feet 6 inches, but this was getting into softer ground, and the hardpan was not broken up so well.

A double charge at 2 feet did splendid work, cracking the ground all round for about 4 feet, and on opening up with a shovel, a hole about 18 inches in diameter was found at a depth of 2 feet.

Mr. Burbury regards these experiments as very successful. The ground was solid clay from the surface, and 3 inches down it was as hard and dry as if baked in a fire, so that it was difficult to get a hole down with a 2-inch auger. On another block, where the hardpan was only from 6 to 10 inches thick, half a plug gave splendid results.

Milling Qualities of Wheat.

VARIATIONS IN THE STRENGTH AND GLUTEN-CONTENT OF LOCAL WHEATS OVER A SERIES OF YEARS.

F. B. GUTHRIE AND G. W. NORRIS.

DOUBT is frequently expressed as to the ability of any fixed variety of wheat to maintain its characteristics over a series of years. This is more particularly the case with regard to the strong-flour varieties created by the late Mr. Wm. Farrer, with special reference to local requirements. Some prominence has been given lately to a statement to the effect that these wheats were deteriorating, more particularly in respect to their gluten-content.

In order to ascertain if any such alteration could be traced, the records of the work done in the testing of wheats and flours in the laboratory of the Department of Agriculture during the last thirteen years have been carefully collated, and the results are presented in the table which accompanies this article. These notes are merely in explanation and amplification of the table.

The wheats and flours tested cover a fairly large field, and include typical farmers' wheats, as well as the cross-breds made and in process of making by this Department.

The term "strength" of flour is used by bakers to denote the combination of properties which produces a flour of good baking quality. These properties are not thoroughly known, but the power of the flour to absorb water is a perfectly reliable indication of its baking quality, at least in the case of our local flour wheats, those flours which absorb the largest proportion of water to produce a dough of the proper consistency for baking always giving the best loaf. The figures under the term "strength" in the tables mean the number of quarts of water required by 200 lb. of flour to make a dough of the proper consistency for baking, and it is to be understood that a high figure means not only more loaves from the sack, but loaves of better texture, lighter and more nutritious.

The figures under "gluten" are the percentages of dry gluten in the flour.

Dealing with the wheats and flours examined :—

1. *Farrer Wheats* (*strong-flour varieties*) include such crosses as Bobs, Comeback, Jonathan, John Brown, Cedar, and other similar varieties, as well as Departmental crosses not at present in general cultivation.
2. *Farrer Wheats* (*weak-flour varieties*) include Federation, Bunyip, Jade, Bayah, Plover, and other such varieties, as well as Departmental crosses not in general cultivation.

3. *Local Soft-wheats* are farmers' wheats of the Purple Straw and Steinweidel type, which are being gradually replaced by the stronger varieties, but which still constitute the bulk of the wheat produced in this State, as will be seen on comparison with the F.A.Q. wheats.
4. *Wheats at the R.A. Society's Show* ("*Strong White*" *class*) are practically confined to the two Farrer wheats Bobs and Comeback, although before 1908 this class was not so rigidly defined, and included other grain of lower flour strength.
5. *Wheats at the R.A. Society's Show* ("*Soft White*" *class*) include both the local soft-wheats (No. 4) and the Farrer weak-flour varieties (No. 2).
6. *F.A.Q. Wheat* is part of the sample taken annually by the Sydney Chamber of Commerce for the convenience of shippers, and represents the fair average quality of the wheat grown in the State.
7. *Millers' Flour* includes typical samples from both Sydney and country millers.

The above classes represent fairly the typical wheats grown in the State, and as the figures are taken from a large number which have been milled and examined each year, the results afford a fair indication of any changes undergone by the individual types, as well as changes due to the seasons.

An examination of the table attached shows that there is no falling off in either strength or gluten-content of the Farrer wheats during the period covered; nor, for that matter, in any other class of wheat. There are seasonal variations, and in this respect the years 1908, 1909, and 1910 have been exceptionally high in both strength and gluten, and have inflated the averages in all cases.

As far as the Farrer wheats are concerned, it will be seen that there is no regular deterioration such as is suggested, but that on the contrary the figures for the present season are close up to the average. The millers' flours show the least variation of any, as might be expected, since the variations in quality due to the seasons are largely counteracted by blending. They nevertheless reflect the high flour strength and high gluten characteristic of 1908–1909. The local soft-wheat class (non-Farrer) are the only ones of which it can be said that there is any indication of a downward tendency in this respect. If we neglect the two years of exceptional flour strength, 1909–10, and the three years of exceptionally high gluten, there is a slight reduction apparent in both these figures; but such reduction is probably more apparent than real, and the conclusion may be drawn that, when dealing with considerable numbers of typical wheats of fixed types, any alterations noticeable are seasonal ones, and not due to alterations in the characteristics of the grain. For the rest, the figures may be left to speak for themselves.

AVERAGE STRENGTH AND GLUTEN-CONTENT OF NEW SOUTH WALES WHEATS, 1900 TO 1912.

Year :—		1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	Average.
Farrer wheats; strong-flour varieties.	Strength	53·3	54·0	52·4	52·0	51·9	51·9	52·2	50·9	52·6	54·5	51·9	53·2	52·5	52·56
	Gluten	13·0	14·0	14·6	15·7	11·8	15·2	16·1	11·5	15·6	16·9	14·1	13·2	13·8	14·27
Farrer wheats; weak-flour varieties.	Strength	47·4	45·5	47·5	46·5	46·5	47·9	46·5	47·3	47·1	49·5	47·5	47·1	46·8	47·16
	Gluten	13·2	16·3	14·1	12·0	9·3	13·6	12·8	10·2	15·0	17·8	12·1	13·3	12·6	13·25
Farrer wheats; all kinds	Strength	51·6	48·0	50·5	49·2	50·8	50·6	49·7	49·8	50·8	53·4	49·7	49·9	49·8	50·30
	Gluten	13·1	15·2	14·4	13·8	11·4	14·6	14·7	11·1	15·4	17·1	13·4	13·3	13·2	13·90
Local soft wheats	Strength	46·3	44·0	45·8	45·5	46·1	46·6	45·8	46·9	46·5	48·7	49·1	45·8	44·9	46·30
	Gluten	10·5	11·8	12·8	10·6	9·4	9·1	10·2	9·2	13·4	12·3	14·2	11·3	10·4	11·17
Wheats at R.A.S. Show; Strong White class.	Strength	...	...	...	...	...	46·6	48·5	48·4	52·5	53·5	50·0	53·4	52·7	50·70
	Gluten	...	...	...	...	...	10·0	11·0	9·3	12·2	11·9	13·8	12·5	13·4	11·76
Wheats at R.A.S. Show; Soft White class.	Strength	...	...	...	...	...	45·2	45·7	45·4	46·4	49·2	47·8	47·0	45·2	46·50
	Gluten	...	...	...	...	...	9·7	9·8	8·3	10·2	8·6	12·1	11·0	10·6	10·03
F.A.Q. for New South Wales.	Strength	...	...	...	...	...	...	45·5	46·1	48·5	48·0	48·0	45·0	45·0	46·60
	Gluten	...	...	...	...	...	...	10·2	9·4	10·6	12·2	10·4	10·2	11·9	10·70
Millers' Flour	Strength	45·9	44·6	46·4	49·0	46·7	48·0	47·4	48·0	49·9	49·9	48·5	46·7	47·9	47·61
	Gluten	10·4	9·5	10·6	10·6	9·5	10·5	9·7	9·9	14·6	15·6	10·2	9·8	11·4	10·94

Legumes v. Non-Legumes in Rotation with Wheat.

EXPERIMENT AT BATHURST EXPERIMENT FARM, 1911.

J. W. SHAW, Experimentalist.

[NOTE.—At the suggestion of Mr. R. W. Peacock, Manager of Bathurst Experiment Farm, the Experiments Supervision Committee two years ago approved of a test being made to determine whether, under the conditions prevailing at Bathurst Farm, there was any advantage in growing legumes in preference to non-legumes in rotation with wheat. The results of the single test are given below. The Committee desire to warn readers that final conclusions cannot be drawn from a single course of such rotations, but the public are entitled to know the interim results of such experiments as they proceed; consequently the Committee have approved of their publication. The experiment is being repeated at Bathurst, and a similar experiment is being instituted at Wagga Farm.—ED.]

THE object of this experiment is to determine whether legumes or non-legumes are the better rotation crops for preceding wheat in the district.

In this experiment the yield of wheat from plots in which only legumes are grown as rotation crops is compared with the yields from plots on which only non-legumes are grown as rotation crops. The crops are not grazed with sheep, but ploughed under at the most suitable stage of their growth.

Treatment of Land Prior to Planting the Rotation Crops.

The land on which the experiment is located was sown with rape and barley in March, 1909, and superphosphate at the rate of ½ cwt. per acre was applied with the seed. The crop was fed-off with sheep during the winter months, and ploughed under in November to a depth of 6 inches. The growth was about 15 inches in height when ploughed under. The land then lay in this condition until February, when it was skim-ploughed 4 inches deep. The rotation crops were sown on the 20th April, 1910, superphosphate at the rate of ½ cwt. per acre being applied with them.

Arrangement of Plots.

The width of each plot was 74 links, and 12 links were allowed on either side of each plot for a neutral area. The object of the neutral area is to prevent diffusion of effect, and to have a space of ground in which the ridges and clean-out furrows can be placed when ploughing the ground. If the land were ploughed in the ordinary way, ridges and clean-out furrows would come in some plots and not in others, and consequently the plots would not be comparable.

The 12 links on either side as a neutral area allowed 50 links for the width to be calculated, by 2 chains in length, making the area harvested for grain $\frac{1}{10}$ of an acre. In each plot an area of $\frac{1}{40}$ of an acre was cut when the wheat was in flower, to ascertain the yield of hay.

Plan showing Arrangement of Rotation Crops.

Buffer.	Cape barley.
1.	Cape barley.
2.	Scarlet clover, treated as bare-fallow.
3.	Rape
4.	Cape barley.
5.	Black tares.
6.	Cape barley.
7.	Wheat after wheat.
Buffer.	Wheat after wheat.

Notes on the Rotation Crops.

The plot sown with scarlet clover failed to germinate, and was treated as bare fallow. All the barley plots made good growth, the barley being about 4 feet in height. The rape and tares were only fair, the rape being about 3 feet 6 inches and the tares about 1 foot, when ploughed under.

Treatment of Ground Prior to Planting the Wheat.

All the plots, with the exception of No. 7 (wheat after wheat), were ploughed 6 inches deep in October, 1910. Every precaution was taken to ensure the green crops being thoroughly covered, a drag chain being used. The land lay in this condition until January, when it was skim-ploughed 4 inches deep. Just prior to planting it was again skim-ploughed to the same depth. Plot No. 7 (wheat after wheat) was ploughed as soon as the wheat was harvested, and again ploughed with the other plots just prior to planting. It will be noticed that this plot had the advantage of three months' fallow prior to planting the wheat.

Planting the Wheat Crop.

The seed, prior to sowing, was treated with bluestone (1 to 60) and lime-water, to prevent the occurrence of bunt.

The plots were planted on the 14th April, 1911, Cleveland wheat being used.

Notes on the Growing Wheat.

The wheat on all the plots was very uniform, but grew rather too rank on the plot which was bare-fallowed. The wheat on the black tares plot was a much darker green than any of the others. The crop on all the plots (with the exception of No. 7) grew to a height ranging from 4 feet 6 inches to 5 feet 6 inches; the wheat on plot No. 7 only grew to a height of 2 feet 6 inches.

Rainfall.

The rainfall for the year was given in the *Gazette* for June, 1912, page 485.

Results.

Variety of Wheat—Cleveland. *Date planted*—14th April, 1911.

Hay harvested—6th November, 1911; area for hay, $\frac{1}{40}$ acre.

Grain harvested—8th December, 1911; area for grain, $\frac{1}{10}$ acre.

Plot No.	Rotation	For Hay.		For Grain.	
		Plot Yield.	Acre Yield.	Plot Yield.	Acre Yield.
		lb.	t. c. q. lb.	lb.	bus. lb.
Buffer ...	Wheat after Cape Barley ..	...	......	...	......
1 ...	Wheat after Cape Barley ..	164	2 18 2 8	176	29 20
2 ...	Wheat after Bare-fallow ...	207	3 13 3 20	208	34 40
3 ...	Wheat after Rape	178	3 3 2 8	228	38 0
4 ...	Wheat after Cape Barley ...	182	3 5 0 0	200	33 20
5 ...	Wheat after Black Tares ...	168	3 0 0 0	188	31 20
6 ...	Wheat after Cape Barley ...	156	2 15 2 24	204	34 0
*7 ...	Wheat after Wheat... ..	91	1 12 2 0	139	23 10
Buffer ...	Wheat after Wheat	...	......	...	......

* This plot, being adjacent, was included in the experiment, as it was considered the comparison would be of value.

Notes.

The Factors which must be taken into consideration with the results, are that the plots growing barley in 1910, grew larger quantities of organic matter, thus using up larger quantities of soil moisture. The crops of rape and tares were not half as bulky as the barley crops, and it is assumed that they did not use so much moisture; therefore, there was more moisture in the subsoils where the lighter crops were grown, and the greatest quantity where bare fallowed.

The colour of the wheat crop after black tares was a much darker green, probably due to the increased nitrates available. This plot, No 5, was of a darker colour than plot No. 2. Plot No. 2, after bare-fallow, grew too rank, which was responsible for the lower yield of grain proportionately to straw. Owing to the low rainfall throughout the wheat's growing season, conserved moisture had considerable effect on the yields.

Birds and Prickly Pear.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

In consequence of the repeated statements in the press, that the distribution of the seeds of prickly pear through the agency of fruit-eating birds was one of the chief difficulties that the Government would have to contend with in any comprehensive scheme for dealing with this ever-increasing pest, I sent a letter to the Editor of the *Stock and Station Journal*, asking country correspondents for first-hand information on this important matter. This letter was printed, and through its publication a number of very interesting replies were received, which show conclusively that the emu, in prickly-pear areas, feeds upon the prickly-pear fruits, and scatters the seeds all over the surrounding country.

One correspondent sent me a small tin full of young prickly-pear seedlings, not more than 3 inches in height, saying that there were thousands of these little plants covering acres of land.

Mr. A. C. Mackenzie, of Well Hill, Charleville, Queensland, said :—

> I had a small property in the Roma district, just about in the home of the prickly pear, and sold out after five years. A good portion of every year I put in pear-clearing, and going over clean country, and I have found hundreds, or rather, I should say millions, of the young pear growing from the droppings of the emu. Sometimes I have found it in regular strings where they have been running along. You mostly find them in a clump of sandalwood, or some scrub near where they have a nest. I have also heard that the seed would not grow after passing through cattle—that on chewing their cud they cracked the seed. I can't say if the seed will grow after being cracked or not; but what I do say is that I have found cattle dung one mass of the little pear, about the size of one's little finger, growing healthy and strong.

Mr. J. Hilton Doyle, of Warranding, Tallwood, Queensland, says :—

> I have seen undoubted evidence of this, having seen the pear so sown growing in patches of anything from 2 inches in length and upwards. Prickly pear may be difficult to grow from seed under ordinary circumstances, but I am of opinion that in passing through the stomach, the seed is materially assisted in germinating. It is quite a common sight to see pear so growing on country where emus are numerous, and seed easily obtained.

Other correspondents state that not only the emu, but quite a number of fruit-eating birds are also responsible for the spread of the prickly pear through the seeds.

We, therefore, know that not only the emu and other birds, but cattle feeding in prickly pear country, spread the pest by the seeds, while all stock—sheep, cattle and horses—can spread it by leaves and stalks carried along in their hair or wool. While emus and stock might be fenced out of prickly-pear areas in the worst country, it would be a very difficult thing to deal with powerful flying birds that feed upon the fruits. The question of destroying all birds that eat prickly-pear fruits has been advocated by a number of correspondents to the papers, but the remedy is certainly worse than the disease, and would lead to worse complications in the increase of insect pests, even if practicable. It would certainly not be tolerated by the community in general, for many of the birds are insectivorous as well as prickly-pear eaters.

In Mexico, the "Land of the Cacti," the general opinion of the natives is that none of the cacti will grow from seed, and when they want to propagate some of the large-fruited kinds about their homes, they always plant a leaf. In the hungry lands of Northern Mexico, both food and drink are obtained from different species of prickly pear and giant cacti. The fruits of many species, and even the larger fleshy leaves, from which the spines have been carefully sliced, are sold in the Mexican markets. My guide informed me that the leaves, sliced up, are used in salads. Around the city of Mexico I never saw a ripe fruit on a prickly pear. Every one is picked off by a hungry Mexican as soon as it is coloured. In the deserts the little rodents devour them, and this is probably why the idea of these cacti not growing from seed has arisen in Mexico. In Australia we have transferred a desert plant, which has taken ages to evolve its protective coat of spines in its struggle for existence against its many enemies, and let it loose in rich lands, where it has no enemies—hence the wonderful spread of prickly pear.

"TWELVE APOSTLES."

MR. E. FACEY, Lachlan View, Forbes, writes:—

> In the August issue of the *Agricultural Gazette*, re Insectivorous Birds of N.S.W., you mention the Babbler, or Barking Bird, sometimes called "Twelve Apostles," but you say this name is also given to another species, *Struthidea cinerea*. In this you are quite right, but you are entirely wrong in saying that the latter bird—the slate-coloured Apostle Bird (*Struthidea cinerea*)—is entirely insectivorous. It certainly is at some seasons of the year, but there is no more destructive bird in the bush on wheat, either in its hard state or when just shooting out of the ground. At this stage it is quite as bad as the Black Jay. I may state that I have observed the habits of this bird here (Forbes), and at Wagga and Corowa in the Riverina, but although I have seen them right up to the Murray, I have never seen any in Victoria.

We are obliged to Mr. Facey for the comment. The bird is not one of those of which plates are being published, as at certain times of the year it is very destructive to crops. At the same time, these Twelve Apostles do much good by destroying insects during nine months of the year, which recalls the old rhyme:—

"There is so much good in the worst of us,
And so much bad in the best of us,
That it ill behoves the most of us,
To find fault with the rest of us."

We did not state that *Struthidea cinerea* is *entirely* insectivorous. Standard works on Australian Ornithology include it amongst the insectivorous species, but we should not regard it as quite as worthy of protection as the Babbler, of which we published a plate.

Trial of Summer Fodder Crops.

NYNGAN DEMONSTRATION FARM.

E. BARING, Experimentalist.

[NOTE.—In authorising the publication of this report, the Experiments Supervision Committee desire to draw attention to the low yields obtained, even with proper cultivation given to the crops. This result was, of course, due to the extremely dry season.—ED.]

WITH the object of testing the possibility of successfully growing summer forage crops, such as sorghums, cowpeas and millets, in the dry Nyngan climate, the following experiment was initiated last year.

Dimensions of plot—Length, 5·5 chains; width, 14 links.

The requisite ground was cleared in February, 1911, and ploughed up early in March to a depth of 6 inches with the disc plough, being broken down with the spring-tooth cultivator. Cultivation was kept up during the ensuing months to provide the necessary soil mulch and destroy any weed growth which occurred.

The seed for this summer variety trial was sown on 11th October, 1911, the ground having carried no previous crop. Germination was rapid, as there was a fair quantity of moisture in the soil. Good rains fell in December, but apart from that the weather was extremely hot and dry throughout the growth of the crops.

The following table gives the varieties tried, the dates on which the different fodders were ready for cutting, and the yield of green-stuff obtained from each:—

Plot No.	Variety	Date harvested.	Yield per Acre.
		1912.	lb.
1	Sorghum saccharatum (*Check*)	January 19	2,071·5
2	Sorghum, Planter's Friend	" 19	1,228·5
3	Sorghum, Early Amber Cane	, 19	1,907
4	Sorghum saccharatum (*Check*)	" 19	2 193
		1911.	
5	Hungarian millet	December 18	821
6	Manchurian millet	" 18	857
		1912.	
7	Sorghum saccharatum (*Check*)	January 19	1,486
8	Black cowpeas	" 19	1,714
9	Sorghum, Early Amber Cane	" 19	1,800
10	Sorghum saccharatum (*Check*)	" 19	1,750
11	Broom millet	Fodder yield not estimated.	
12	Sorghum saccharatum (*Check*)		

The sorghums were all inclined to be patchy in growth, some plants doing much better than others. The millets grew to maturity very rapidly, though the weight of fodder was rather small. Cowpeas grew rather poorly, but a crop of them grown in the orchard gave very good results and proved an excellent sheep-feed. Broom millet, which can hardly be called a fodder crop, grew to about the same height as the other sorghums, but the heads were of poor quality.

The above yields may appear to be extremely small to the farmers of more favoured districts where the rainfall is large, but the value to us of even a light yield of summer green-feed is considerable, and is sufficient at any rate to warrant the continuance of this experiment.

KANGAROO GRASS.

A SPLENDID sample of Kangaroo grass (*Anthistiria ciliata*) has been received from Dunedoo through Mr. Beahan. It is 7 feet 6 inches high, and of exceptionally vigorous growth. Mr. Beahan states that the grass was taken from the black soil of Dunedoo last April.

The merits of this grass have already been pointed out through the pages of the *Gazette*. They may be summarised as follows :—

(1) It is very widely destributed, growing in all kinds of situations, and under all sorts of conditions.
(2) It is tussocky grass and very drought-resistant.
(3) It is an excellent grass for stock, and makes hay a very fair quality.

Unfortunately the grass is a very shy seed-bearer, and propagation from seed is very difficult, though not impossible. Overstocking soon kills it out—hence the contrast between the abundance of this grass on railway reserves and its scarcity in adjoining paddocks.

It behoves all farmers and graziers to encourage the propagation of this tried and trusty friend, Kangaroo grass.—E. BREAKWELL, Economic Botanist.

PROCLAMATION AGAINST IMPORTATION OF STRAW OR HAY FOR FODDER.

BY proclamation in the *Commonwealth of Australia Gazette* of 21st September, 1912, the Governor General has, under the Quarantine Act, 1908, prohibited the importation into Australia of straw or hay for fodder purposes. The reason for the prohibition is that it is likely that Foot and Mouth Disease may be introduced into Australia by means of fodder.

Profitable Dairy Farming.

HANDSOME RESULTS.

P. G. HAMPSHIRE, Dairy Instructor, Port Macquarie.

THE following excellent returns from two small dairy farms came under my notice recently, and I have secured detailed information, which may be of interest to dairymen in practice and to persons contemplating dairying.

The farmers whose returns are given below have obtained the results for the year ending 30th June, 1912; and, as may be supposed, are keen, practical men who spared no trouble in their attention to and care of the business in all details.

A Fine Return.

No. 1 farmer rents an 82-acre farm at £100 per annum. The farm is reclaimed swamp land, well grassed with paspalum, couch, and clover. Four acres are cultivated for green fodder. The farm is comparatively level, and subdivided into six paddocks, and the milking herd was changed into the various paddocks frequently, thus ensuring a fresh pasture.

The rainfall for the year under review was 62 inches. The herd comprises splendid types of grade milking Shorthorns and Jerseys, most of which the owner purchased at various centres, selecting always the best. The bull is a Jersey. The cream is taken by the butter factory practically from the dairy door, as the farm is situated on the river bank.

STATEMENT OF ACCOUNTS.

Stock and Plant at beginning of year.	£	s.	d.	Stock and Plant at end of year.	£	s.	d.
29 cows, at £5 10s.	159	10	0	42 cows, at £6	252	0	0
6 heifers, at £3	18	0	0	5 heifers, at £2 10s.	12	10	0
1 bull	10	0	0	1 bull	10	0	0
3 sows, at £3	9	0	0	4 sows, at £3	12	0	0
1 boar	3	0	0	1 boar	3	0	0
Young pigs	11	0	0	Young pigs	28	10	0
2 horses (1 light, 1 draught) .	30	0	0	2 horses	30	0	0
Farm implements, plant, &c, not including separator ...	25	0	0	Farm implements, &c. ...	24	0	0
13 cows purchased November..	63	0	0				
	£328	10	0		£372	0	0

STATEMENT OF ACCOUNTS—*continued.*

Income.	£	s.	d.	Expenditure.	£	s.	d.
6,786 lb. butter, as per factory account	413	2	0	Rent	100	0	0
Fat cows sold (5) ..	23	0	0	Sundries	4	0	0
Pigs sold	107	5	6	Balance	439	7	6
	£543	7	6		£543	7	6

	£	s.	d.
Net income for year	£439	7	6
Increased value of stock at end of year	43	10	0
Net profit for year	£482	17	6

These figures show that with a capital of £328 10s., a net profit of £482 17s. 6d. for one year has been made. As a matter of fact, this farmer at the commencement of the year had stock to the value of only £265 10s. The balance of stock was purchased in November, and he would then have four months returns in hand. There were only 40 cows milked during the year, and the returns show an average of nearly 220 lb. of butter, or £10 6s. 6d. per cow. No allowance is made for separator, as this was rented with the farm, together with utensils. No labour was employed, so no expense was incurred in this respect, the farmer doing the work with his wife and elder son. Fowls were not kept, and only five heifers reared. The corn grown (about 5 acres) was fed to pigs and horses.

The Value of a Good Bull.

No. 2 farmer rents 42 acres, and pays a rental of £48 10s. per annum. Twenty-six acres of this farm are rich alluvial—nothing better—and the balance, 16 acres, is second class land. Couch, clover, and paspalum are the principal grasses. No hand feed was grown. Rainfall for year, 55 inches.

The herd comprises Jerseys and Grade Jerseys, the latter being by Tidy's Punch (by Melbourne Punch from Lady Tidy III (imp.), bred by the Department of Agriculture). The cattle were bred by the owner. Cream and produce are taken about 5 miles to the wharf for shipment.

STATEMENT OF ACCOUNTS.

Stock and Plant at beginning of year.	£	s.	d.	Stock and Plant at end of year.	£	s.	d.
23 cows 9 heifers 5 pigs	160	0	0	23 cows 11 heifers Pigs Bull	220	0	0
1 bull	30	0	0				
Implements, plant, &c. ...	30	0	0	Implements	25	0	0
	£220	0	0		£245	0	0

STATEMENT OF ACCOUNTS—*continued.*

Income.	£	s.	d.	Expenditure.	£	s.	d.
5,987 lb. butter, as per factory account	276	1	4	Rent	48	10	0
Stock sold (young)	7	10	0	Balance	255	1	4
Pigs sold...	20	0	0				
	£303	11	4		£303	11	4

	£	s.	d.
Net income	£255	1	4
Increased value of stock	25	0	0
	£280	1	4

In this case full particulars could not be secured. Labour was employed, but the amount paid could not be ascertained. The profit shown is as near as possible without allowing cost of labour, which should not be a big item in this case. On this farm were running 23 cows, 1 bull, 11 heifers, and 5 horses.

The great feature of this farmer's year's work is the wonderful return of £276 1s. 4d. from 23 cows, which is an average of 255½ lb. of butter, or over £12 per cow per annum.

THE "HOG MOTOR."

SOUTH DAKOTA (U.S.A.) Experiment Station reports trials with a machine called the "Hog Motor," for fattening pigs—(Bulletin No. 136). This is "a machine so constructed with a pair of burrs that the hog is compelled to grind all the corn before he receives it." The advantages claimed are that the corn gives better fattening results when ground, and that the exercise is good for the hogs, besides saving the cost of grinding. The tests appeared to bear out the claims, because the hogs made better gains with the machine than when fed with corn-meal in the ordinary way. With ordinary corn-meal, a bushel of corn gave 9·79 lb. of pork, but when the hog had to work for his feed a bushel of shelled corn gave 9·94 lb. of pork. So the "Hog Motor" is taken seriously, and is no relation to Bill Nye's machine for curing bacon, in which the hog works a treadmill, and drives the machinery to kill and cure himself.

FEEDING CALVES ON CHEESE-MAKING FARMS.

"J.B." sends his milk to a cheese factory, and asks for a substitute for the fat and other substances removed from the milk, as he feeds the whey to calves. Cocoanut cake or linseed oil cake, dissolved in warm water and added to the whey, at the rate of 2 to 4 oz. per calf according to the ages of the animals, may be given.—M. A. O'CALLAGHAN.

Judging Green Fodder Maize.

SCORE CARD.

THE following score card has been drawn up by Messrs. R. N. Makin and A. H. E. McDonald, Inspectors of Agriculture, and may be found valuable to those who, at times finding themselves called upon to judge growing crops of maize from a fodder point of view, might welcome a scale of points :—

SCORE CARD.

Green Fodder Maize.

Exhibitor .... *Variety* ....

Date of Sowing .... *Date of Cutting* ....

	Points.
1. Height of stalk	10
2. Condition of grain on cob	10
3. Number of cobs on stalk	5
4. Percentage of leafiness	15
5. Freedom from fungus and other pests...	10
6. General appearance of stalks	10
7. Weight per acre	20
8. Freedom from growth of weeds	10
9. Character of stems	10
	100

Explanation.

1. As bulk is an important point, a high stalk is an advantage.
2. For best feeding value, grain should be in the glazing stage.
3. Several small cobs are to be preferred to one large cob.
4. A greater amount of digestible nutrients is contained in the leaves than in the stalk and hence the advantage of leafy varieties.
5. Smut, boll-worms, weevils, &c.
6. Stalks should be well grown and of good colour.
7. Weight to be taken by selecting an average portion of the growth of the patch, and not less than 16 feet 6 inches square cut and weighed.
8. Showing care and attention in cultivation.
9. Fine, soft stems are preferable to coarse, hard stems for forage purposes.

USING EGGS PRESERVED IN WATER GLASS.

BEFORE putting preserved eggs into water to boil, they should be perforated at the end with a needle, thus allowing air to escape. The needle does not require to be driven far in—only just sufficient to perforate the shell.

Influence of Soil upon Maize.

F. B. GUTHRIE, Chemist.

A STRIKING instance of the influence of soil on the quality of maize was observed recently. Mr. W. Zuill, of Lower Southgate, forwarded, through the Manager of the Grafton Experiment Farm, two samples of maize, one grown on poor, sandy, forest soil, and the other on good river-bank land.

The forest soil had been treated with 1 cwt. superphosphate per acre. The maize on the river-bank land was grown after a summer crop of potatoes. This latter soil was of the richest description, and the crop was vigorous from start to finish. On the forest land the crop was patchy, the stalks being, as a rule, spindly and delicate-looking, with yellowish or light-green leaves.

Mr. Zuill reported that the maize grown on the poor land had little or no value for feeding purposes, whereas the maize produced on the rich land, when fed to horses, gave them "heart" immediately. Mr. Zuill forwarded samples of the maize produced, which were analysed, with the following results:—

	A Grown on Poor Forest Soil.	B Grown on Good River-bank Land.
	per cent.	per cent.
Moisture	12·79	12·38
Ash	1·03	1·36
Fibre	1·96	1·51
Ether Extract (fat, &c.)	4·32	5·40
Albuminoids	6·83	10·28
Carbohydrates (by difference)	73·07	69·07
	100·00	100·00
Nutritive value	90·7	92·9
Albuminoid ratio	1:12·3	1:8·

The most striking feature in the above analyses is the remarkably low proportion of nitrogen (albuminoids) in sample A. The average albuminoid content for locally grown maize is about 10·8 per cent., and very few samples contain as little as 10 per cent.; so that the low figure here obtained is quite exceptional, and fully accounts for the low feeding value of this sample.

In order to ascertain whether this deficiency could be traced to poverty of the soil in plant-food, samples of the soil on which the crops were respectively grown were asked for, and analysed, with the following results:—

	A Poor Forest Soil.	B Good River-bank Soil.
	per cent.	per cent.
Volatile matter (humus)	2·62	5·42
Lime (CaO)	0·245	0·405
Potash (K_2O)	0·042	0·162
Phosphoric acid (P_2O_5)	0·035	0·127
Nitrogen (N)	0·078	0·106

The differences in the proportions of plant-food are remarkable, and the poverty in this respect of sample A appears to be quite sufficient to account for the poor growth and low feeding value of the maize.

DESTROYING FLIES.

BLOW-FLIES always go on to the windows, consequently insecticide dusted along the window sills or on the edge of the windows is very effective if done every few days. The essential oil in the insecticide or Pyrethrum powder kills by contact.

For house-flies, we find a saucer containing 15 parts water (or water and milk in equal parts) and 1 of formalin, in the centre of which is placed a crust of bread sprinkled with sugar, is very attractive to flies. They come to the saucer and die all round it. Measure the proportions of water and formalin with a teaspoon.

When closing up a room or kitchen infested with flies, cover up all food and liquid, place the saucer on the table on a sheet of newspaper or in the brightest place in the room, and the flies will soon die out.—W. W. FROGGATT.

ANTS IN AN APIARY.

A GOOD plan is to trace the ants from the apiary to their nest by the tracks they make. At night, stop up with clay every entrance to the nest but one. Through the open entrance, dose the ants' nest with about 2 tablespoonfuls of carbon bisulphide and close it with clay. After a few doses, always given at night, the nest will die out.

If the legs of the stands on which the hives rest are stood in tins of water no ants should reach the bees; but long grass must be kept clear of the tins, or in windy weather it is apt to blow across them and form a bridge for the ants.

Moth balls rubbed on the woodwork of hives have been found to keep away the small ants.—R. G. WARRY, Demonstrator in Apiculture.

Experiment in Inoculation of Lucerne.

A. V. DONNAN, Experimentalist, Hawkesbury Agricultural College.

[NOTE.—This experiment was only commenced this year, and no results of cuttings are yet available. The Experiments Supervision Committee have approved of the publication of the following article, as an interim report as to the nodule-producing effect of bacteria aided by lime. The effect of the different treatments upon the quantity of produce will be shown by later reports when available.—ED.]

Object.—To ascertain the value or otherwise of the different methods of inoculation of seed and soil alone and combined with different manures, in establishing lucerne on ground which has not grown lucerne before.

Soil.

The soil on the area chosen for this experiment is a well drained red sandy loam. The area is uniform throughout, but during the last few years the manuring has not been uniform, as will be seen from the previous history of the plot.

Previous History.

Previous to 1907 the cropping and manuring of this area were uniform. Thenceforward, the cropping was as follows :—

1. Potatoes planted August, 1907, with various manures.
2. Wheat planted May, 1908, with various manures.
3. Potatoes planted February, 1909, with various varieties.
4. Maize planted September, 1909, with various manures.
5. Potatoes planted September, 1910, with various manures.

This continuous manurial experiment was discontinued in 1911, and in May, 1911, a crop of wheat for grain was planted with the following manure :—

Half cwt. superphosphate, ½ cwt. bone-dust per acre.

This crop was removed in November, 1911, and the land fallowed for the present lucerne crop.

The effect of the continuous manuring on the results of the experiment will be discussed later.

Methods of Inoculation.

The following methods of inoculation are being tried :—

1. Inoculation of seed with lucerne rhizobia ;
2. „ soil with lucerne rhizobia before sowing ;
3. „ „ „ after germination ;
4. „ „ with soil of similar composition from an established lucerne area ;
5. Inoculation of the soil with soil of dissimilar composition from an established lucerne area ;
6. Inoculation of seed with vetch rhizobia.

Manures.

With each method of inoculation the following manures are applied :—

1. No manure.
2. Lime.
3. Superphosphate, sulphate of potash and sulphate of ammonia, a complete manure.

Preparation for Sowing.

The ground was ploughed deeply in November, 1911, and during the fallow period from November to May the area was skim-ploughed and harrowed whenever necessary to kill weeds and conserve moisture. On 8th and 9th May the ground was ploughed 6 inches deep, harrowed twice, rolled, and the plots pegged out prior to sowing.

Dimensions of Plots.

The dimensions and arrangement of the plots are shown in Sketch A.

Sowing.

The experiment was sown as follows :—

9th May.—Plots B2, C2 and D2 were watered with diluted culture of lucerne rhizobia late in the afternoon.

Plots B3, C3 and D3 were sown with inoculated lucerne seed.

Plots F4, G4 and H4 were sown with lucerne seed inoculated with vetch rhizobia.

10th, 11th and 13th May.—All remaining manures and seed were sown and hand-raked in. The soil applied to plots F1, 2 and 3, and G1, 2 and 3, was spread broadcast and raked in with the seed.

1st June.—Plots B1, C1 and D1 were watered with diluted culture of lucerne rhizobia. The plants were then peeping above the soil.

Quantity of Seed Sown.

Seed was sown at the rate of 20 lb. per acre, each plot receiving 3·8 oz.

Quantities of Manures Applied.

1. Lime was applied at the rate of 1 ton per acre.
2. { Superphosphate was applied at the rate of 1 cwt. per acre.
   Sulphate of potash was applied at the rate of ½ cwt. per acre.
   Sulphate of ammonia was applied at the rate of ½ cwt. per acre.

Quantity of Soil Applied.

Plots receiving soil were top-dressed at the rate of 7 tons per acre (approximately). Before sowing the soil was first sieved to remove any roots of harmful weeds, such as couch grass.

Details of Methods of Inoculation.

1. *Inoculation of Seed.*—The lucerne seed and fine sand were steeped together in a culture of lucerne rhizobia. The mixture was sown when dry enough to handle.

2. *Inoculation of Soil with Lucerne Rhizobia before Sowing.*—The culture of lucerne rhizobia supplied by the Bureau of Microbiology was diluted to 100 times its volume with water, and distributed over the plots with a watering-can. At the same rate of application, 7 gallons of culture, diluted to 700 gallons with water, would suffice for an acre.

3. *Inoculation of Soil with Lucerne Rhizobia after Germination.*—After the plants were visible above ground, the plots were watered in the same way as in No 2 (Inoculation before Sowing).

4. *Inoculation of the Soil with Soil of similar composition from an Established Lucerne area.*—Red sandy loam from a lucerne paddock established in March, 1909, was obtained for this purpose, sieved, spread over the surface of the plots, and raked in with the seed.

5. *Inoculation of the Soil with Soil of dissimilar composition from an Established Lucerne area.*—A heavy alluvial loam from an old established lucerne paddock was applied in the same way as in No. 4.

6. *Inoculation of the Seed with Vetch Rhizobia.*—Inoculation was carried out in exactly the same way as in No. 1 (Inoculation of the Seed with Lucerne Rhizobia).

Germination.

Germination was very satisfactory throughout the whole area, although the crop was sown late in the season.

Notes on Growth.

There has been considerable difference noticeable throughout the area. Those plots receiving a complete manure show the best growth. All plots limed have shown an increased growth over those unmanured. All differences appear to be due to manuring and not to inoculation.

Growth of Nodules on Roots.

On Saturday, 17th August, a detailed examination of the area was made. From each plot were taken ten samples from evenly distributed spots in the plot, so that results obtained would be as nearly representative of the plot as possible. Each sample consisted of a clump of lucerne plants raised with a trowel. Nine inches of the main root and the secondary roots down to that depth were generally secured, but odd secondary roots were lost at times, despite the utmost care. The average number examined per plot was, approximately, 74. The actual number examined in any one plot varied according to the thickness of the crop at the spots selected.

In Table I are given the results obtained.

Effect of the Continuous Manuring on the Results.

The area chosen (B15) is situated in the best and deepest soil on the Experiment Plots, and is uniform in character. There are other areas of the same character, but these have been occupied in the past by the same continuous manurial experiment. Any of the remaining land is either unsuited to the growth of lucerne or is of such variable composition that it would be impossible to interpret results from it.

Results.

In interpreting results it must be borne in mind that the plots receiving different manures in the manurial experiment extended in the direction AD (see Plan A). As a result, the variation due to continuous manuring extends in the direction AB, while any original variation in the soil in the direction AD is lessened by the uniform treatment received.

The deductions to be drawn from the above facts are that—

1. The comparative values of—
   a. Inoculating by watering soil after germination ;
   b. Inoculating by watering soil before sowing ;
   c. Inoculating seed with lucerne rhizobia ;
   d. No inoculation ;

and of

   a. Inoculating seed with vetch rhizobia ;
   b. Inoculating soil with soil,

are confirmed ; and

2. The comparative value of—
   a. Inoculating soil with soil of same composition ;
   b. Inoculating soil with soil of different composition,

may have been influenced by other conditions.

As will be seen from Table I, the efficiency of the various methods of inoculation is in the following descending order :—

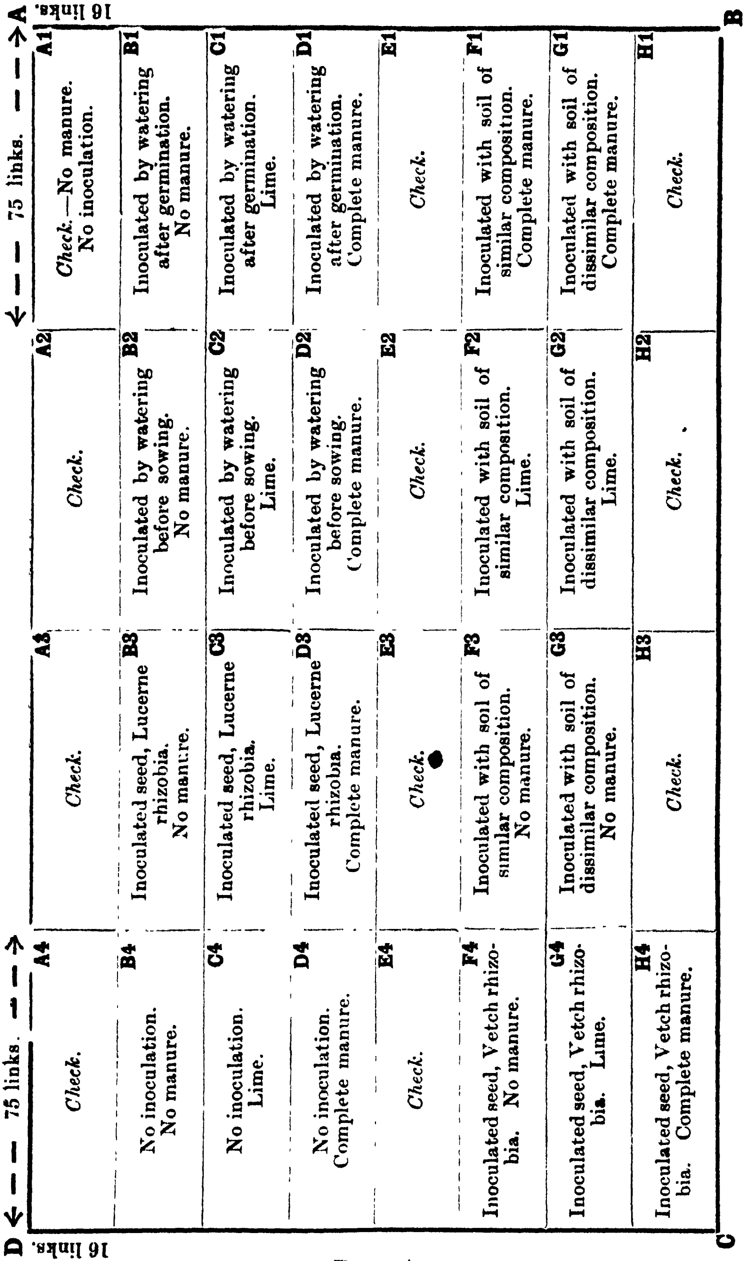
1. Inoculation of soil with soil of same composition ;
2. Inoculation by watering soil after germination ;
3. Inoculation by watering soil before sowing ;
4. Inoculation of soil with soil of dissimilar composition ;
5. Seed inoculated with lucerne rhizobia ;
6. Seed inoculated with vetch rhizobia.

Influence of Manure.

Lime applied to plots caused an enormous increase in the number of plants with nodules, and also increased the number of nodules per plant. Where, however, no lucerne rhizobia were introduced, the presence of lime caused practically no difference.

Complete manure did not, on the totals throughout, increase the number of nodules, although an increased growth of both stem and root was caused by its application.

In view of the fact that the soil in this experiment is strongly acid in reaction, it is probable that lime has increased the growth of nodules by neutralising part or all of this acidity, and thus promoting better conditions for bacterial growth.



	1	2	3	4
A	**A1** *Check.*—No manure. No inoculation.	**A2** *Check.*	**A3** *Check.*	**A4** *Check.*
B	**B1** Inoculated by watering after germination. No manure.	**B2** Inoculated by watering before sowing. No manure.	**B3** Inoculated seed, Lucerne rhizobia. No manure.	**B4** No inoculation. No manure.
C	**C1** Inoculated by watering after germination. Lime.	**C2** Inoculated by watering before sowing. Lime.	**C3** Inoculated seed, Lucerne rhizobia. Lime.	**C4** No inoculation. Lime.
D	**D1** Inoculated by watering after germination. Complete manure.	**D2** Inoculated by watering before sowing. Complete manure.	**D3** Inoculated seed, Lucerne rhizobia. Complete manure.	**D4** No inoculation. Complete manure.
E	**E1** *Check.*	**E2** *Check.*	**E3** *Check.*	**E4** *Check.*
F	**F1** Inoculated with soil of similar composition. Complete manure.	**F2** Inoculated with soil of similar composition. Lime.	**F3** Inoculated with soil of similar composition. No manure.	**F4** Inoculated seed, Vetch rhizobia. No manure.
G	**G1** Inoculated with soil of dissimilar composition. Complete manure.	**G2** Inoculated with soil of dissimilar composition. Lime.	**G3** Inoculated with soil of dissimilar composition. No manure.	**G4** Inoculated seed, Vetch rhizobia. Lime.
H	**H1** *Check.*	**H2** *Check.*	**H3** *Check.*	**H4** Inoculated seed, Vetch rhizobia. Complete manure.

PLAN A.

Showing dimensions and arrangement of plots. Each plot is 16 links x 75 links, an area of $\frac{12}{1000}$ acre.

In the direction of A B are pathways 9 links wide.
" C D " 6 "
The whole block, A B C D, is surrounded by a buffer area of lucerne.

TABLE I.

RESULTS of Examination.

Plot.	Inoculation.	Manure.	Number examined.	Number with nodules on roots.	Number without nodules on roots.	Percentage with nodules on roots.	Remarks.
A1	Check ...	... .	44	0	44	0	
B1	Inoculated by watering after germination.	No manure ...	69	12	57	17	Fairly large; 3 or 4 on a plant.
C1		Lime	70	55	15	79	Large to medium size; scattered; average five.
D1		Complete manure	70	15	55	21	Large size, scattered.
E1	Check ...	... .	75	0	75	0	
A2	Check ...	... .	83	2	81	2	
B2	Inoculated by watering before sowing.	No manure ...	70	2	68	3	
C2		Lime	128	107	21	84	Average 6 per plant; scattered, medium size.
D2		Complete manure	84	6	78	7	Scattered.
E2	Check ...	....	66	1	65	2	
A3	Check ...	.. ..	69	1	68	1	
B3	Seed inoculated with lucerne rhizobia.	No manure ...	69	0	69	0	
C3		Lime	52	7	45	15	Average 5 per plant; small; 4 inches from top.
D3		Complete manure	63	5	58	8	Top 4 inches.
E3	Check ...	....	77	0	77	0	
A4	Check ...	....	64	0	64	0	
B4	Not inoculated.	No manure ...	62	0	62	0	
C4		Lime	75	1	74	1	
D4		Complete manure	66	0	66	0	
E4	Check ...	.. ..	76	0	76	0	
F1	Inoculated with soil of same composition.	Complete manure	89	55	34	62	Average 6; scattered.
F2		Lime	85	82	3	96	,, 7; ,,
F3		No manure ...	94	79	15	84	,, 6; at top and scattered.
G1	Inoculated with soil of different composition.	Complete manure	74	4	70	5	
G2		Lime	85	56	29	64	Average 3; scattered.
G3		No manure ..	78	6	72	8	Scattered.
H1	Checks.	....	62	0	62	0	
H2		... .	97	0	97	0	
H3		.. ..	72	0	72	0	
F4	Seed inoculated with vetch rhizobia.	No manure ...	64	0	64	0	
G4		Lime	72	0	72	0	
H4		Complete manure	73	0	73	0	

The Tobacco-growing Industry.

WITH SPECIAL REFERENCE TO THE WHITE AUSTRALIA POLICY.

J. E. O'GRADY.

"No language," says Dr. Norman Kerr, "can accurately describe the comfort enjoyed from a pipe when exposed to severe weather in trenches, or the power it has to stay the stomach-crave when no food is to be had, and this action of tobacco, under such circumstances, cannot be harmful." It would be a very incongruous position, however, for Australian troops, fighting for their supremacy of their race in the South, to be compelled to overcome any weakness in the commissariat department by smoking Chinese-grown tobacco.

The Official Year Book of New South Wales for 1911 contains the following:—

> For seven or eight years prior to 1889 the area under cultivation for tobacco grew steadily, until in that year it reached the highest figure it has ever attained, namely, 4,833 acres. As, however, the local product did not compare favorably with the American leaf, it could not be exported profitably, so that a large proportion of the crop remained upon the farmers' hands, and as the quantity sold realised very unsatisfactory prices, due mainly to the failure to produce, by cultivation and curing, a first-grade article, many growers abandoned tobacco in favor of other crops. With the accumulation of stocks of leaf, and the fall in the price of the local product, the area under the plant and the resultant yield declined rapidly, until in 1895 the acreage was only 716. During the next two years there was a little more activity, and the area increased to 2,744 acres in 1897; it, however, fell away again after that year, and in 1902 it amounted to only 182 acres. During the next four years the area increased, and in 1906 it was 809 acres; but in 1908 it had declined to 533 acres. Since that year the area has increased to 1,096 acres, owing to the increased attention paid to the curing of the leaf. Tobacco manufacturers have endeavoured to stimulate the industry by offering good prices for suitable leaf. and employing an expert to assist and instruct the growers. * * * * Tobacco of excellent quality has been produced, but much of it is now grown by Chinese, who consider weight rather than quality, and an inferior leaf is the consequence.

Statistical.

The importation of unmanufactured tobacco into the Commonwealth during 1911, was 14,900,520 lb., valued at £508,559. The amount of Australian leaf used in factories during 1911, was:—

For tobacco	1,207,115 lb.
„ cigars	16,591 „
„ cigarettes	1,570 „
Total	1,225,276 lb.

The area under tobacco throughout the Commonwealth for 1911, was 2,612 acres.

It thus appears that only about one-twelfth part of the people's smoke is grown in Australia; and it is a well known fact that the great bulk of that one-twelfth is grown by Chinese.

Fiscal.

The import duty on tobacco, manufactured or unmanufactured, is 3s. 6d. per lb., but this is reduced if the tobacco is entered to be locally manufactured into tobacco or cigarettes, to 1s. 6d. unstemmed and 2s. stemmed, partly stemmed, or in strips; whilst for tobacco to be so made into cigars, the duty is 2s. 6d. unstemmed, and 3s. stemmed, partly stemmed, or in strips. On cigars the import duty is 7s. 6d. per lb., and on cigarettes 6s. 6d. On tobacco from British Colonies or Protectorates which are included within the South African Customs Union, the duty is, manufactured or unmanufactured, 3s. 3d. per lb.; and from the United Kingdom, 2s. 6d.

The excise duties are:—Tobacco made in Australia, from imported or local grown leaf, 1s. per lb.; hand-made strands, 9d.; hand-made plug, 9d.; cigars, machine-made, 9d., hand-made, 3d.; cigarettes, 3s. per lb., hand-made, 2s. 9d.

On snuff there is an import duty of 6s. 6d. per lb., and an Excise Duty of 2s. per lb.

In 1907, the Commonwealth Government provided for the payment of a bounty of 2d. per lb., up to £4,000 per annum, for five years, on Australian tobacco leaf, grown by white labour, for the manufacture of cigars of a prescribed quality. The bonus has recently expired by effluxion of time.

The Chinese Entente.

In the Tamworth-Manilla district, which is now the largest tobacco-producing section of this State, the work is mostly done by Chinese, upon the shares system; occasionally land is rented. The following is the usual form of agreement:—

MEMORANDUM OF AGREEMENT made this tenth day of June, 1912, between JOHN WHITEMAN, of Nicotine Farm, near Tamworth, in the State of New South Wales, farmer (hereinafter called the owner), of the one part, and AH FAT and AH LEEN, both of Tamworth aforesaid, gardeners (hereinafter called the farmers), of the other part.

1. The said owner agrees to employ the said farmers to farm about thirteen acres of land, being portion of the owner's Nicotine Farm aforesaid, having a frontage to the river bank, and to be fenced off by the owner, and the said farmers agree to farm the said land.
2. The said farmers agree to plant and grow upon the said land tobacco and such other crops as the said owner shall direct, but they shall grow at least thirteen acres of tobacco.
3. The said farmers shall work themselves in a proper and continuous manner.
4. The said farmers shall provide the tobacco plants of the most satisfactory variety for this district, and shall cultivate the said plants in a proper and husbandlike manner and in the best way possible to ensure a good crop, making all necessary drains and watering the crops when necessary.
5. The whole of the said crops from the time they are put in until they are sold shall be the sole property of the said owner, but the said owner shall, when the crops are ready for market, give to the said farmers, between them, a fair half of the said crops, and such half shall be determined on the said land, and then and there be handed over to the said farmers as their property. Except as hereinafter provided, the said owner shall not be liable to the said farmers for any other payment whatsoever.
6. The said farmers shall at their own expense, except as hereinafter provided, harvest and prepare the said crops for the market in the best manner possible with the least possible delay.
7. The said owner shall for his part plough the said land in the first instance for the reception of the crops; shall find green lucerne feed for one horse of the farmers during the tenure of this agreement; shall cart the farmers' share of the said crop of tobacco to

the nearest railway siding as soon as he is required to do so; shall provide proper and efficient shed accommodation for the crop of tobacco; shall allow the farmers the use of a hut for themselves; shall supply a four-inch compound centrifugal pump and eight horse-power engine for irrigation purposes, and shall provide the labour for driving and working the said pump; and shall find tobacco sticks and forks.

8. The said owner shall further pay the said farmers the sum of ten shillings each per week, but such sums shall only be paid for such time as each man shall actually be working.

9. If any further labour shall be required for the purpose of properly planting, cultivating or harvesting the said crops, then the said farmers shall, with the consent of the owner to be first obtained, employ such additional labour, and the said owner and farmers shall each pay one-half of the wages and tucker of such additional labourers.

10. The farmers shall provide tobacco seed, hessian, twine, and all other articles, other than those hereinbefore mentioned, for the cultivation and preparation of the said crops.

11. This agreement shall commence as from the twentieth day of June next, and either of the parties hereto shall be at liberty to terminate the same by giving three months' notice of his intention so to do, such notice to expire on the corresponding day of the year of that in which the agreement is to commence, namely, the twentieth day of June, 1912.

12. If the said farmers shall make default in the covenants or agreements herein contained on their part to be observed and performed, or any single one of them, it shall be lawful for the owner immediately upon default to eject the said farmers, their servants, and workmen, from the said lands, and to prevent the said farmers from returning thereto for any purpose whatsoever.

13. Neither the said owner nor the farmers shall remove any of the said crops from the said land without the consent of the other of them.

IN WITNESS WHEREOF, &c., &c.

The condition of affairs outlined above cannot be regarded as satisfactory from a national point of view. There are two aspects of it—(1) we do not produce more than a small fraction of the tobacco which we consume; (2) even that small fraction is mostly grown by Chinese.

The Views of the Buyers.

On the first aspect—the small extent of our production—Mr. John Gilmour, Tobacco Expert for Messrs. Wills (Limited), who buys the greater portion of Australian-grown tobacco, states that the local leaf has a peculiar flavour, which the public taste does not like. A leaf can be produced of excellent colour and texture, but on account of the peculiar flavour, it can only be used for blending with American leaf for making the cheaper grades of plug tobacco. This last season has been very suitable for curing tobacco, on account of the dry weather, and consequently the price has been high; but he warns people against rushing into tobacco-growing, as the production of inferior leaf may easily far exceed the demand. He recommends flue-curing in preference to sun-curing, and states that in ordinary seasons the difference in value between flue and sun-cured leaf is between 2d. and 3d. per lb. Moreover, he says that, considering the greater trouble required, and the enhanced value of the leaf, there is not the slightest danger of the supply of properly flue-cured tobacco exceeding the demand for very many years to come. The flue-curing must be done properly, however, as properly sun-cured tobacco is preferable to badly flue-cured. He recommends that the varieties White Stem Orinoco and Yellow Pryor, and perhaps Big Frederick and Yellow Mammoth, be grown, and flue-cured to obtain the best colour. The lighter the colour the better. He cannot recommend the cultivation of cigar-leaf, as only a high-class cigar can be sold in Australia, and he does not think it can be produced from local leaf.

Mr. Perkins, buyer for Messrs. Birt & Co., of Brisbane, only purchases a limited quantity of tobacco. He considers that local leaf, properly cured, is as good as American leaf, and he denies that there is anything in our climate which prevents the production of a high-class tobacco. He states that when our growers learn to properly cure and sweat their tobacco, the local product will be in every way as good as the American. The seasons are more regular in America, but that is easily overcome here by means of irrigation.

With regard to this matter, the writer had the privilege of smoking a leaf of Chinese-grown, sun-cured tobacco, taken direct from the bulk in the shed. It was vile. If that tobacco were supplied to Australian troops in trenches, it would kill more men than the enemy's fire. It would have one advantage, however, in that the odour of the burning leaf would demoralise a storming party. Later, I was presented with a hand of flue-cured tobacco, grown and cured by a white man who never grew tobacco before last year. It was far from being a perfect tobacco, as it burnt rather badly and left a taste in the mouth; but it made a fairly pleasant smoke, and no doubt a manufacturer could work it up into a very saleable article. I smoked a pipeful of it in the train, in the presence of some unsuspecting commercial travellers, a class of people little disposed to submit quietly to inconvenience in railway travelling, and there was no complaint. I afterwards gave some to my friends in Sydney, and they found it quite smokable in the raw state; though none of them expressed any desire to exchange their usual brands for it.

The Chinese Question.

Mr. T. G. Adamson, of "Ngoora," Nemingha, made ineffective efforts to obtain white labour to grow tobacco, and was compelled to employ Chinamen on shares. He thereupon urged the Department of Agriculture to obtain a few young men, from the Old Country if necessary, and have them trained to tobacco-growing, so as to give a start to production by whites. Mr. A. H. E. McDonald, Inspector of Agriculture in the North-west, was asked to report upon this scheme, and I was instructed to obtain as much information as possible upon the condition of the industry for publication in the *Gazette*. Mr. McDonald and I visited various farms together.

The first step, of course, was to read some literature on the subject of tobacco-culture. A very good text-book is "Tobacco Leaf," by Killebrew and Myrick, published by the Orange Judd Company, New York, U.S.A. A less ambitious work, but one containing valuable practical hints, is Mr. John Gilmour's pamphlet, "Tobacco Culture," which can be obtained from this Department. There are a number of other books and pamphlets, but these two will give a prospective grower as much help as he is likely to get from reading alone.

It appears to be necessary to the progress of our Commonwealth that white men should take up the cultivation of tobacco. It has been decided that the coloured population of the country shall not be permitted to increase in the same proportion as the white; and who is to grow our tobacco when the Chinaman has gone? And are we to always import eleven-twelfths of our tobacco—a product of the soil? If we are to produce it here, then it can only be done as the result of patient experiment and careful handling—work of which the Chinaman, despite his industry, seems utterly incapable.

The fact that most of the tobacco grown in New South Wales is produced by Chinese, appears to be due to two causes—(1) a disinclination on the part of white men to engage in this form of cultivation; and (2) until the last year or two, other avenues of production have offered better returns for the same capital and labour. Some hold the opinion that the Chinese have secret knowledge of the work, but an examination of the facts will dispel this opinion as absurd. The white men growing tobacco near Manilla appear to have learnt more about the industry in a year or two than the Chinese have learnt in half a century.

The Chinaman at Work.

At the time of our visit to the district, the tobacco was just germinating in the seed-beds. These are prepared by working up the ground nicely into long beds, about 3 feet wide and as long as convenient. Furrows are made between the beds, for drainage purposes. The bed is firmed with a box, and the seed mixed with ashes and sown. A fine layer of manure is put over it, and the beds are covered with straw or grass. There is no burning of the beds, as recommended in the text-books, to destroy weed-seeds, insects and fungus pests before sowing.

As the young plants came up, there were far more weeds than tobacco plants. The Chinese pull these weeds out in due time. If there is danger of a frost, they cover the seed-beds with bags, suspended on a framework of wire. When the plants are about 6 inches high, they are planted out by hand in holes prepared for them. It takes two men about four weeks to plant out 12 or 14 acres. The growing crop is "topped," "suckered," and "wormed" in the manner described in the text-books, and weeds are kept down with the hoe. When ready, the plants are cut, left to hang five or six weeks, according to the weather, on poles in the paddock, and then taken into the shed, stripped, made into "hands," bulked and baled. The Chinamen would prefer no rain at all during the whole period of growing and curing, as they could then irrigate and cure without having to remove the tobacco to the shed when the weather threatens. The Chinese ridicule flue-curing, which they say is foolish when there is plenty of sun.

In all this business, many people are convinced that there is some deep knowledge required. As a matter of fact the Chinese are producing tobacco under very crude conditions, and of very inferior quality. A man cannot grow good tobacco with theoretical knowledge only, but the white man of ordinary intelligence who goes into the business for a living is soon found selling his tobacco at a higher price than the Chinamen receive.

Something about Soils.

The soil upon which the tobacco is grown near Tamworth is the chocolate alluvial flats of the Peel River. This is a deep, rich, usually well drained soil, containing a very large percentage of clay, but rich in lime, so that it is friable. It is, in fact, the famous Tamworth lucerne ground.

Messrs. Killebrew and Myrick describe the soils best adapted for the growth of yellow tobacco in Virginia and North and South Carolina. They are sandy, grey soils, well drained, but almost barren of plant-food, either in their virgin state or by exhaustion from long-continued cropping. They are practically useless for any other crop than tobacco. Clearly they are very different from the rich flats of Tamworth.

The varieties known as " Heavy Shipping Tobacco," which include White Stem Orinoco and Yellow Pryor, and are grown chiefly for shipment to Europe, are produced mainly in Tennessee and Kentucky on " strong, rich, soil, not necessarily deep, but with a large content of potash in its composition. Low river bottoms subject to overflows rarely produce the best qualities of this tobacco. Too much vegetable matter in the soil, imperfectly decomposed, makes a large, rough, harsh tobacco, wanting in all the best qualities of a shipping tobacco. Upland soils are usually better drained than bottom lands, and the humus from such soils, receiving no additions from other than natural sources, is not excessive. For this reason, other things being equal, such soils are preferred for tobacco."

In the Cumberland River District of Tennessee and Kentucky, " tobacco is grown mainly on the low bottom lands, and is coarse and bony, wanting in flexibility, deficient in oil, but having a good weight. Heavy tobacco is grown in many parts of Virginia and North Carolina on dark, rich soils with reddish subsoils, upon which yellow tobacco is never produced. * * * Some good shipping leaf is grown in the great Kanawha Valley and in the counties along the Ohio River in West Virginia; the alluvial soils producing the best leaf. Missouri's production has fallen rapidly, as its leaf has large stems and fibre, being grown generally on rich bottom lands on the north bank of the Missouri River."

Further information respecting the tobacco soils of America may be found in bulletins of the United States Department of Agriculture, such as Farmers' Bulletin, No. 343, " The Cultivation of Tobacco in Kentucky and Tennessee "; No. 416, " The Production of Cigar-leaf Tobacco in Pennsylvania, ' and others. Perusal of these publications gives the impression that the finest leaf is produced upon soils which are of the nature of a sandy loam, rich in lime and potash, but not excessively well supplied with vegetable matter. Soils of this nature occur within the Murrumbidgee Irrigation Area (*vide Gazette*, August, 1910, page 663), and it may be that experiments will prove some of these soils more suited for the production of high-priced tobacco leaf than any soils yet tried in the State, and the action of the Government in appointing an expert to investigate the possibilities of the area in this direction is a wise move. The alluvials of the Peel River, on the other hand, appear to be suitable for the production of only the common tobaccos—the people's smoke. Their great advantages are their open texture and usual good drainage, and the facility with which they can be irrigated. It would appear hopeless to attempt the cultivation of cigar-leaf or other fine textured tobacco upon them, for their fertility is phenomenal, and, though friable, they contain a much greater proportion of clay and silt than would commend them for such a purpose.

A Large Grower.

Mr. Richard Brown, "Menedebri," Somerton, claims to be the largest grower of tobacco in the State. About 75 acres of his property are put under tobacco each year by Chinese working on the shares system. There are nine Chinamen regularly working, and these employ nine more when required. Mr. Brown finds horses and plant, drives the engine for irrigation, and takes one-third of the crop, leaving the other two-thirds to the Chinamen. No wages are paid.

Mr. Brown states that during the past nine years, three crops have been total failures—two caused by "blue mould," and one by flood. (The Chinese growers are often credited with some occult preventives for mould.) For the nine years the Chinamen's returns have not exceeded £1 per week per head; but for the past two years they have averaged £250 per head per annum.

The soil is a heavy, dark-coloured alluvial. The subsoil is stiff, blackish clay at 2 feet; then reddish clay; then gravel. The yield of tobacco, in a fair crop, is from ¾ to ⅞ ton per acre. It is sun-cured in the stalk by the Chinamen, and in some years the colour is very much better than in others. There have been four good crops, five inferior ones, and three total failures.

The tobacco is graded into "No. 1" and "No. 2." "No. 2" is selected by the head men when the tobacco is being put into hands and put on one side. All the other leaves are tied into hands as "No. 1." About 20 per cent. of the crop is "No. 2."

For this last season, the average price received for "No. 1" was a little below 9½d. per lb., and "No. 2" brought 4¾d. In the previous season, "No. 1" averaged 9¾d., and "No. 2" 4½d.

Mr. Brown has a suction gas plant of 37 horse-power, driving a pump capable of lifting 120,000 gallons of water per hour to a height of 30 feet. He makes his own charcoal, and finds that the plant consumes 1½ bushels of charcoal per hour, the cost of which is about 3d. per bushel. He has spent a great deal of money in plant, sheds, &c., and takes a deep interest in the future of the industry. He regards it as necessary that white men should take up tobacco-growing, as there is danger, under the present system, of both the farmers and the public being left at the mercy of the Chinese.

The Rent System.

Mr. T. Dowe, of Wallamore, just below Tamworth, lets 125 acres of land to Chinese for the production of lucerne, tobacco and vegetables. This last year, about 60 acres were put under tobacco. The crop must have been worth about £3,000. Eight or ten men were employed all the time on the tobacco work, and twelve or fourteen at harvest time, by the two Chinese firms renting the land.

The first crop, three years ago, was a failure owing to the flood. The next one was sold for 8½d. per lb., and the Chinese immediately paid up the rent owing. Last year the price received was 9½d. per lb. The soil is heavy alluvial, with clay at a depth of 18 inches to 2 feet.

Mr. Dowe has also spent a very considerable sum in fitting his property for tobacco-growing. He considers that a man ought to make a good living by combining vegetable-growing or some other reliable industry with tobacco, so as not to be dependent upon the tobacco alone, which is an uncertain crop.

Gleams of Hope.

An Englishman with Queensland experience, who desires that his name should not be published, has seed-beds planted this year for 50 acres of tobacco, and hopes to handle the crop entirely with white labour. He has three local men employed, and expects to be able to get more. These three he is teaching the business, with the idea of placing them in charge of smaller farms with an interest in the returns. His methods are the same as those of the Chinese, and he sun-cures his crops. The extra price received for flue-cured tobacco does not, in his opinion, cover the extra cost involved.

Mr. J. Brown, who has a mixed farm with river frontage, grew 1¼ acres of tobacco last year, and found it profitable—so much so, that he is trying 16 acres this year. His first attempt was in 1910, when he lost the crop in the flood. He proposes to work the tobacco with the aid of his family and the men employed for other purposes. He plants on the "check" system, the plants being in line in both directions, so that horse cultivation can be given both ways. He has several other improvements upon the methods of the Chinese, but he sun-cures in the same way as they do. He considers there is a good living in tobacco and vegetable-growing, as the white man's labour is much more efficient than that of the Chinaman.

These gentlemen are demonstrating that there is nothing in the supposed secret knowledge of the Chinese, and that white men can do the work and turn out as good a product, and at the same time work a larger area per man. But they have not yet met the great requirement from a national point of view—the production, by white labour, of a tobacco superior to that grown and cured by the Chinamen, and in such a way as to return a reasonable profit to the grower. The industry can make no real progress until that is done, as we shall still have to import the great bulk of our leaf. Once the quality of the commercial product begins to improve permanently, we can hope that, under the influence of the white man's brains, the improvement will continue until we are in a position to meet all local requirements, and perhaps even export our surplus to British or other markets.

The Realisation.

It was at Manilla that we found the justification for this opinion. Mr. Stoddart, a Manilla storekeeper, who takes a keen interest in the industry, was able to refer us to a number of men who are growing tobacco and obtaining a much higher price than is paid to the Chinese. Amongst names mentioned were those of Messrs. Hermann, Gibson, Blevin, Bach, Reynolds, Chain, McRae, and Smith. It was not possible for us to visit all these men. Mr. Stoddart pointed out that white men prefer to rent land rather than work on shares, unless they have no capital at all. He considers that flue-curing pays, and that the flue-cured leaf has the same aroma as the American leaf; that consequently there is no danger of over-production of that class of tobacco. All the growers flue-curing this year received 1s. per lb. for their leaf except one, in whose case, for some reason unknown to Mr. Stoddart, only 10d. was received. Mr. Stoddart says that the growers now engaged in the industry are willing to give other white men full information as to the cultivation of the crop, which is not a very difficult matter, whilst Mr. Gilmour will explain the flue-curing process to them. He estimates a good average return to be £40 per acre.

The Chinaman Outclassed.

Mr. H. Hermann, a young South Australian, is working on the shares system on land owned by Mr. J. Liston, and flue-curing his crops. He commenced three years ago with a partner, and grew 8 acres; then 20; then 4½ on his own account. His partner was an old gardener, and they picked the business up as they went along. A Mr. Howell explained the flue-curing process to them.

Mr. Hermann harvests and cures by the "single-leaf" method. The ordinary method of harvesting tobacco is to split the plant down to within 2 or 3 inches of the lower leaves, and then cut it off near the ground. By inverting it, the whole plant can then be hung over a pole to cure. In the "single-leaf" method, the leaves are cut from the stalks in the field, and cured by impaling them on short wires standing out at right angles to a stick. The question of method is still being debated in America. The chief advantage of the "single leaf" method is that the leaves can be harvested as they ripen, instead of cutting the whole plant at once; the result being that the whole crop can be cured uniformly, leaving little or no inferior "seconds."

The barn used by Mr. Hermann is made of weatherboards, lined with ruberoid. It is in four compartments, each really being a separate barn, measuring 20 feet high by 20 feet by 15 feet on the ground. Each barn is in three separate bays, and holds 12 cwt. of single leaves. There is a ventilator in the skylight, but none on the eaves or near the ground. The heat is provided in the ordinary way for flue-curing, by means of a brick furnace, opening outside the barn, and an iron pipe proceeding therefrom, inside the barn to the other end, across the end, and back to a discharge, outside the building, on the same side but a little higher than the furnace. The total capacity is thus 48 cwt. of single-leaf. When cured, the tobacco is dry and brittle, and has to be steamed, to "order" it before it can be moved. This is accomplished by putting wet bags over the flues and starting the fires. Total cost, £250.

The "bulking room," where the tobacco is stored for sweating and baling, is a pisé structure measuring 38 feet by 18 feet clear, 8 feet to the eaves, and 9 feet 6 inches to the ridge; but Mr. Hermann would advise either building 2 feet higher or putting in a wooden ceiling, as the iron gets hot and evaporation is great.

Mr. Hermann has a wooden frame press, his own invention, for baling tobacco. It is worked with a screw jack.

Something Better in Cultivation.

But not only in the treatment of the harvested product are the Chinaman's methods surpassed. The whole process of cultivation is modernised and rendered more effective.

The seed-beds are made with a slight ridge along each side, to keep the moisture in and protect the young plants from wind or rough weather, and the beds are carefully watched for mould. If it is commencing to appear, the water is kept off, and the plants allowed to wilt a little. Watering the furrows instead of the surface is also useful. If the mould gets the upper hand the bed is dug right up, all plants destroyed, the bed burnt, and another start made.

Mr. Hermann described fully the method of preparing the seed-bed, sowing (a teaspoonful of seed mixed with a pint of ashes will sow a bed 18 feet by 3 feet), watering, transplanting, topping, suckering, irrigating, and harvesting; but as this article is not intended for a treatise on tobacco-growing, and is already getting long, a brief *résume* must suffice. A man going in for tobacco should learn all this from the experienced growers.

The Bemis Planting Machine is used wherever the ground is level enough. This machine requires two men and a boy, and two slow horses. One man drives, and the boy hands the plants to the other man, who sows. The machine opens the furrow, and pours out a pint of water on the spot where the plant is to be set. The sower puts the plant in its place, and the machine presses the earth around it as it passes on. Mr. Hermann set out 12,000 plants (3 acres) in one day with the machine, which he claims as a record for the district. By hand the two men and boy would hardly sow an acre a day. The machine cost £23 10s., landed in Manilla. There are several others in the district. The results are as good as those obtained from hand-planting.

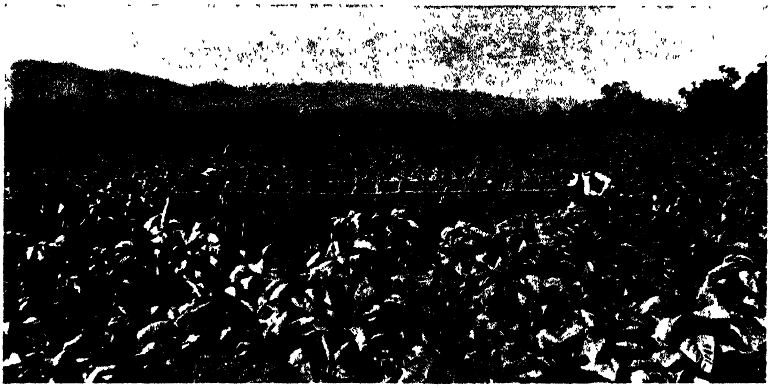
When hand-planting has to be adopted on account of the conformation of the ground, Mr. Hermann prefers not to use the dibbling stick, which tends to make the plant "pot-bound" by firming the soil too much. Instead a hole is chopped with a hoe, the plant placed against the edge, the dirt filled in, and the plant watered.

About eight weeks after planting out the tops are snapped off, and immediately the plants throw out suckers. Once a week, until harvest time, the suckers have to be pulled off. This is the most troublesome work in tobacco-growing, though, of course, it is not heavy work.

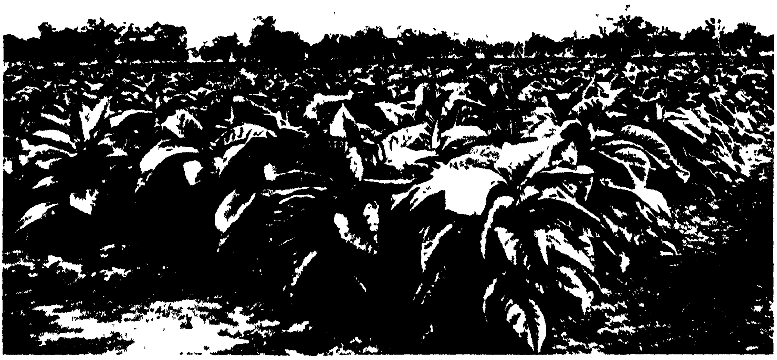
In an ordinary season two irrigations suffice. In a drought four might be necessary. Cultivation with the Planet Junior is always given after irrigation, and generally the correct principles of irrigation farming are observed.

In "single-leaf" harvesting the stalks are not cut at all, but the leaves are gathered into baskets as they ripen, carried to a sledge on the roadway, and hauled straight to the barn for placing on the wires and curing. After curing the tobacco is bulked, either in hands or in loose-leaf bulk, and is inspected by the buyer in bulk. When ready for delivery it is baled.

The soil here, while still on the river bank, is much more sandy than at Tamworth and Somerton. Red clay is met at a depth of about 3 feet. A fair yield is half a ton or a little more per acre.



A partly harvested crop at Nemingha.

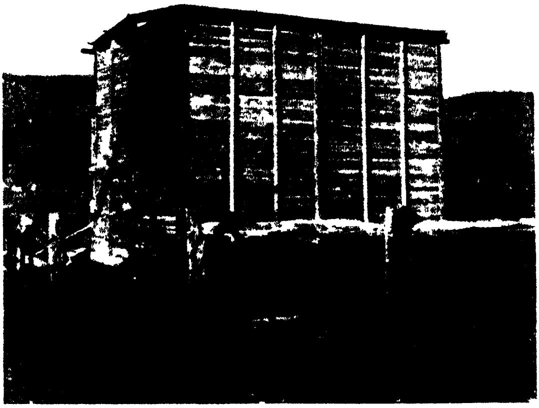


A heavy crop at Wallamore

TOBACCO-GROWING BY CHINESE IN TAMWORTH DISTRICT.

Mr. Hermann's Curing Barn and Bulking Room.

Watering the Seed-beds.



Mr. Gibson's Barn.

"WHITE" TOBACCO AT MANILLA, N.S.W.

Mr. Hermann estimates that one man could manage 4 acres of tobacco, or more if he had the assistance of his family. He might expect to receive up to 1s. per lb. for his flue-cured leaf. The industry offers better chances for two partners, who might undertake 10 acres, but an extra man would be required from the time the plants were put out. In the curing one man must be in attendance at the barn night and day, so as to maintain correct temperatures and see that all goes well.

The White Man's Grit.

Mr. C. W. Gibson is a shearer, and a firm believer in the White Australia policy. Last year he decided to grow tobacco, which is a very different thing from making tallies with machine or blade. He rented 4½ acres of land from Mr. C. A. McDonald, Manilla. Mr. Gilmour gave him a copy of his pamphlet on Tobacco Culture, which contains Ragland's formula of temperatures for flue-curing bright tobacco in the stalk. He built a barn 22 feet by 19 feet and 18 feet high, of tongued and grooved boards, lined it with paper felt, fitted it with a single flue, and made it into a three-tier barn for stalk-curing, with an adjustable ventilator on each side at the bottom and a larger one on each end of the roof. He finds now that he made a number of mistakes in designing the barn (for instance, it should have two flues), but he built it himself, at a cost for materials of £30. Then he grew his 4½ acres of tobacco and cured it. The result panned out thus:—

	£	s.	d.
1¾ tons No. 1 Bright at 1s. per lb.	196	0	0
3 cwt. No. 1 Dark (Green) at 6d. per lb.	8	8	0
6 cwt. Broken Bright Leaf at 6d. per lb.	16	16	0
	£221	4	0

Mr. Gibson has had no experience of curing by single leaf, but he thinks it should be better if one understood it thoroughly. In a year like the past one flue-curing does not, in his opinion, pay the grower better than open-air curing on account of the extra cost, which left the grower in about the same position either way, but it gives greater security to the crops. If the curing season is wet, sun-cured tobacco will become very dark, whilst flue-cured will not suffer so much. Last season was exceptionally favourable for open-air curing.

This year, Mr. Gibson is experimenting with two different styles of seed-bed. One is banked up like Mr. Hermann's and covered with grass; the other is flat, but has a hessian cover, supported in the centre by a longitudinal pole. The advantage of the hessian is that the plants can be sunned by turning it back; but this has also to be done for watering, whereas the other bed can be watered through the grass or straw. He has a planting machine, and hopes to get in between 8 and 10 acres for the coming crop. This will require one man and himself, with an extra man at suckering and harvest time. If he were sun-curing, the extra man would not be needed.

A Bit of Figuring.

Mr. Gibson considers that this industry would be very suitable for two partners. They might work 8 acres of ground, renting it at say £2 per acre with house found. They would need to employ an extra man from about the beginning of February to the end of April. They should erect two barns, about 20 feet by 15 feet and 18 feet high (this size would only need one furnace to each barn). They would need a pumping plant with portable engine (which could also be used for steaming the cured leaf to bring it into condition); 2 horses; a single-furrow plough, cultivator, harrow and planting machine. Thus the outlay would be :—

	£
Barns, 2 at £50 each	100
Pumping plant and engine	200
2 slow horses	40
Implements	30
Wages, 1 man for 12 weeks	24
Tucker for 2 men for 12 months	50
Rent of land	16
	£460

The returns from the 8 acres might be taken as 4 tons of No. 1 Bright, which at 1s. per lb. amount to £448. So the plant and buildings would be practically paid for in one year. The work starts in April, and the money is not received till October in the following year, but thereafter it is a regular annual return. Moreover, the men would have a good deal of idle time for shearing or following other occupations. Mr. Gibson would recommend this industry to the consideration of men following occupations requiring heavy manual labour, such as shearing, who wish to secure themselves for the afternoon of life, as an old man can grow tobacco if he knows how.

The Present Position.

We have, then, proof that white men can grow tobacco, of a quality with which the Chinaman cannot compete, and make a good living out of it. We have also the assurance of the buyers that tobacco of that quality is never likely to be over-produced. It seems that the next step is to encourage men to go in for this class of cultivation. When we get a number of men engaged in the industry, organised amongst themselves, it seems reasonable to expect that the quality of their produce will be steadily improved, by experiment with varieties, methods of cultivation and curing, and so on, until we shall find their numbers so extended that we shall be producing a very large proportion of our own smoke. When we exceed the local consumption, if the product is good enough the export market is before us. A body of producers, so organised, would be in a strong position to reason with the manufacturers, and would have the support of the community if any attempt were made to treat them unfairly.

The most obvious practical step in this direction would be the formation of an association of business men to advance the industry of high-class tobacco-growing, for it is in their interest to do so. Imagine what it would mean to, say, Tamworth, if every 8 acres of the Peel River flats supported two families!

A Precedent.

There are Sydney boys, still in short trousers, who can remember when poultry-farming for egg-production was practically unknown in this State. It is now one of our most firmly established industries, with its home on the hungry soil lying between the City of Sydney and the Blue Mountains. That industry has been artificially created, mainly by the enthusiasm of a few interested business men, who organised and successfully conducted the Hawkesbury College Egg-laying Competitions. A hen has been invented which lays a lot more eggs and eats a lot less feed than was previously the habit of hens, and a large number of comparatively poor men have found it profitable to breed and feed that hen. The Committee have gone on with their work, testing and contriving to make that hen lay more eggs and eat less feed, until we find the following appearing in *Poultry*, one of the leading journals of the United States:—

> The time has now come for the editor of *Poultry* to acknowledge that he is beaten. Nine years ago, in a spirit of raillery, we published in "Commercial Poultry" a brief résumé of the report of the first competition, and jestingly remarked that 130 eggs in a year were not much, at the same time inviting Australians to send to this country for some real layers. This challenge was taken up, and the next year several pens of American hens were sent over. A pen of Rose Comb Brown Leghorns, belonging to Mrs. Haskell, of Loup City, Nebraska, came out second best. The next year seven pens of American hens were sent over, but the best any one of them could do was to reach fifth place. After that no more American hens were sent. In the meantime Australian hens have been getting better records each year, while in this country there is no evidence that anything has been done to improve the laying quality of our hens. No doubt, if the money spent at Maine Station had been spent along lines similar to the Australian competitions, we would have had a better chance to claim that our hens are as good as those of our Sister Commonwealth in the South Seas.

Think of it, Tamworth! Uncle Sam, the prince of hustlers and the king of specialists, raises his hat to Johnny Cornstalk and acknowledges himself beaten at his own game!

I had the pleasure of reporting the Fourth Annual Conference of Poultry Farmers, held at the Hawkesbury Agricultural College, on 15th June, 1912, and attended by over 400 poultry farmers, all making a living out of that heavy-laying, light-feeding hen. Our poultry farmers are hard-working, bustling, enthusiastic citizens, flocking to cheer our genial Mr. Bradshaw when he lectures on their beloved industry, and eager to obtain the latest expert opinion upon questions of feeding, incubating, breeding or disease. The Department of Agriculture receives more requests for pamphlets dealing with poultry than with all the other industries combined. And these men include shearers, miners, carpenters, clerks, labourers—all sections of the Australian people, who have listened to the call of the utility hen, and become poultry-farmers.

The same can be done with tobacco-growing. It is an industry which embraces far less dabbling in filth, far less continuity of work, far less disappointment from uncontrollable accident, and withal returns far greater profits. What poultry-farmer makes £250 a year from his own labour? All that is required is organised enthusiasm, and the favoured tobacco-growing districts will have reason to be grateful to the fragrant weed, which, "like its next of kin, the Irish potato, has made the conquest of the earth; it is the stay of nations, the poor man's luxury and the rich man's solace."

But where is the Australian Virginia to be—at Ashford, Tamworth, Tumut or Yanco?

The Vine in Australia.

[Continued from page 64.]

M. BLUNNO, Viticultural Expert.

Preparing the Soil for a Vineyard.

It is generally accepted that the vine may prosper in districts with a limited rainfall, but the question of rainfall is a very relative one, not only with regard to the nature of the plant itself, but also to the distribution of the rainfall, to the mechanical texture of the soil, and to its preparation before planting, to its working afterwards, also to the method of training the vine. Vines grow luxuriantly at Corowa and at Junee, with rainfalls of 21·64 and 20·46 inches respectively, but a lower average would still be sufficient provided the soil were light or, or if it be clayey, provided the ground were deeply disturbed before planting and well worked afterwards.

At Brindisi, Italy, the average rainfall is only 18 inches. There the vine is extensively cultivated, but the ground is hand-trenched to a depth of 24 to 30 inches, and three times a year the soil is hoed with a big short-handled hoe down to a depth of 8 to 10 inches; and this explains why vines there can be so closely planted; there are about 4,000 of them to the acre. Vineyards in that district are long-lived, and 500 gallons to the acre is a normal crop. The juice contains from 24 to 26 per cent. of sugar; the wines are strong and deep in colour—in fact those wines have a reputation as blending wines, and the bulk was exported to France when the output of the French vineyards had fallen through the ravages of Phylloxera. Breaking the soil fine on the surface, and disturbing the ground to a great depth, gives all the advantages of several inches of rainfall, and this is a very old principle.

It is hard to disjoin in the mind of the old-fashioned, as well as of the modernly-trained viticulturist of the Old World, the idea of planting a vineyard from that of suitably preparing the ground by breaking it well down to 24 to 30 inches. If this viticultural axiom is not honoured in certain countries, the reason is to be found in the rather complex labour question which affects all new large countries with a sparse population. Certain industries like the vine industry, requiring a good deal of hand labour, cannot be pursued with that time-honoured thoroughness well nigh traditional in the vine-growing districts of Europe. Yet we see, in places like the Counties of Cumberland and Camden in this State, that table grape-growers undertake the hand-trenching of the ground before planting, and they break it loose down to 26 and 27 inches, just as is done "at home" by the owners of small areas, who, by sheer hard work, make 5 acres do for 10.

About fifteen years ago the trenching by hand of an acre of fairly stiff clay soil to a depth of 24 inches, cost from £45 to £50. The usual rate was from 6s. to 7s. per rod, and a man would hand-trench one rod per day. The same work to-day would cost about 25 per cent. more. Many small blocks of 2 and 3 acres were hand-trenched by the proprietor himself, who did a little at a time, and so formed vineyards which would compare favourably with any like plantation in the most advanced districts of older vine-growing

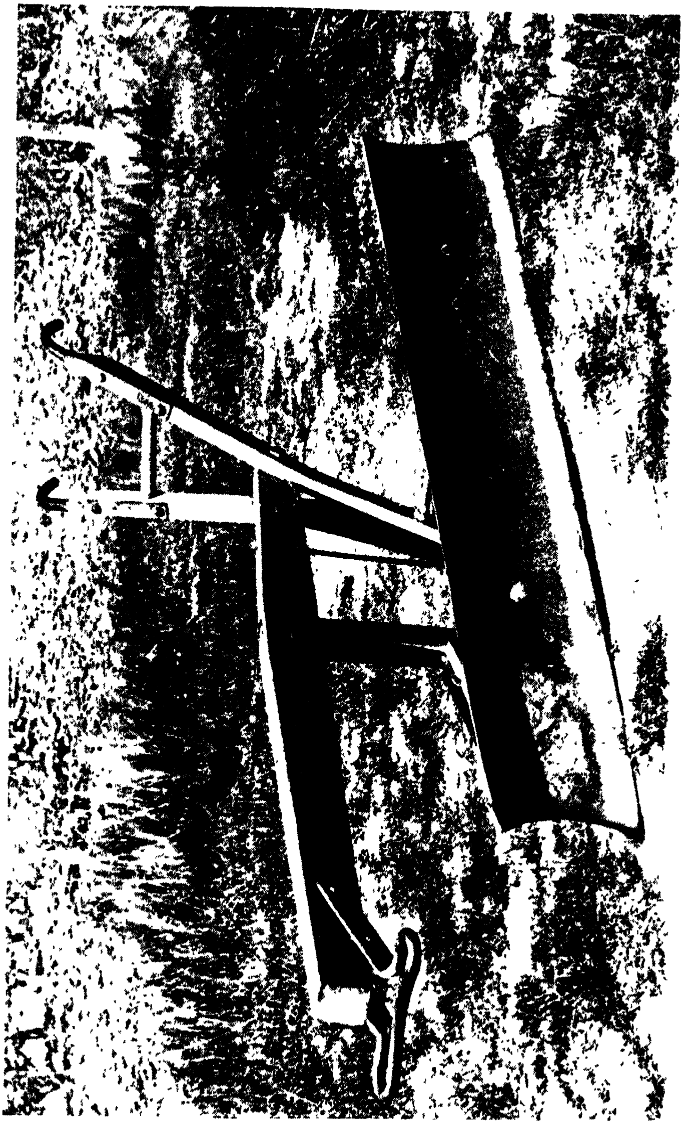


Fig. 1.—Scoop used in Mr. J. G. Bull's vineyard, Fairfield.

countries. Other growers, especially those who have relatively larger areas to plant, use horses and implements to assist in the trenching, the work being done by ploughing layer after layer, and scooping the soil into the trench alongside, as will be explained later.

In the vine districts of Riverina, on this and the other side of the Murray, the ground is subsoiled with horse or bullock teams, reaching a depth of from 14 to 16 inches. Heavy clayey lands so subsoiled set hard again after six or seven years; such has been our experience at the Viticultural Station at Howlong; and it has been the practice to subsoil the ground again every five years or so, down to 12 or 13 inches. In one year the ground is worked only on one side of the vine; the following year the other side is done, so as not to cut too many roots at the same time. Phylloxera-resistant stocks require ground well and deeply disturbed more than the ordinary vines, and growers should bear this in mind.

At the said Viticultural Station, green manuring of the vineyard is a yearly practice. We find that, among other advantages, it helps to loosen the ground and keep it open.

Fig. 1 represents a sort of reversible scoop, which, in conjunction with a reversible plough, is used to trench the ground in the County of Cumberland.

Suppose it is desired to trench the ground 24 inches deep. A trench is opened by hand at one end of the vineyard, 2 feet 6 inches wide by 2 feet deep. Take then a reversible plough, and cut three wide or four narrow furrows off the top. Take the reversible scoop, and scoop the soil of those three or four furrows into the trench. A sort of ledge is thus formed. Plough, then, two furrows off the second depth, and scoop the soil into the trench. Next take two more furrows and scoop again. With a shovel, level the soil on the ledge and in the trench. Now for the third depth. Plough all the third ledge and shovel the soil clean out into the trench, and clean the top of the ledge, so as to leave it properly level. Then the ledge is ploughed again, but the soil thus disturbed is left where it is. Continue as before on the next land, starting as already stated, by ploughing three or four furrows off the top, and scooping the soil into the trench opened by the plough.

The hotter and drier the country the greater the depth to which the soil should be disturbed before planting. This principle is observed all through Europe; experience showed its correctness, perhaps before a rational explanation could be given, founded on chemical and physical laws. Thus we find in the southern parts of Europe the ground being trenched down to 3 and 4 feet, while on the northern boundary of the viticultural zone, say in the Champagne district, the planting is done in a soil that has been broken but 6 or 7 inches. In hotter countries it is desirable for the roots to live within the deeper layers, where they find a more moderate temperature and sufficient moisture; in cold climates, on the contrary, the roots will find the indispensable degree of heat nearer the surface.

There are soils which in their virgin state would seem unfit to grow anything. They are often very heavy, poor clays, mixed with small stones, hard as a rock in dry weather, stiff, sticky, impervious. Such soils, although so unpromising, are hand-trenched down to 20 or 24 inches. The few inches of top soil, which the chemical action of the soil has improved, and with which some humus is mixed, are placed at the bottom, while the subsoil is brought to the surface. This inversion of top soil and subsoil is pretty general in the vine-growing districts around Sydney. It is a very rational practice. It is thus that soils which the casual observer condemns as unfit for anything are transformed into beautiful vineyards of table grapes, 4 or 5 acres of which keep a family comfortably. When that clay subsoil is broken up and brought to the surface; when by the trenching operation air is mixed; and when either drain pipes or stones or logs are put at the bottom, the surplus water is carried away, the soil is aerated, and the thermic or temperature conditions of the ground are improved.

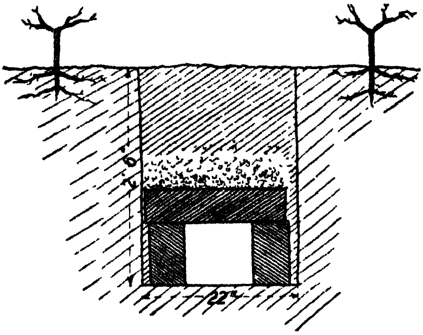


Fig. 2.—Draining a heavy clay soil.

Heavy clay soils are better drained, and this can be done in a rough and inexpensive manner by using flat stones or slabs, as shown in Fig. 2.

It often occurs in this country that virgin land is planted with vines. Growers are cautioned to extract all roots, large and small, down to a depth of at least 2 feet 6 inches, and to remove any rubbish which may breed mould and cause the vines to be affected by the white rot of the roots, or *pourridie*. This *pourridie* can do incalculable damage; once it gets hold of a few vines it spreads to others, till the whole of the vineyard is affected. It is a serious disease, which eventually kills the vine. Even phylloxera-resistant stocks are not exempt, some of them being particularly liable to it.

The best time for the trenching of the ground would be all through summer and autumn, so that the ground has time to sweeten before planting. When the ground has to be broken with plough and subsoiler, it is difficult to undertake the work in summer, the ground being then dry and hard, but after the first autumn rains it becomes easier.

When preparing ground which has grown vines before, it is necessary to heavily manure; the manure being incorporated with the soil in the act of trenching, or of ploughing and subsoiling. About half a ton of bone-dust per acre will tend to relieve the poverty of that ground. Other substances of slow decomposition are also very suitable for the purpose, such as hair, hoofs, refuse of slaughter-yards, ashes, soot, &c.

When the subsoil is of good chemical nature and of suitable mechanical texture, that is, when not very hard and impervious, the land may be broken in a more economical way. The soil is first ploughed from 10 to 12 inches deep; a subsoiler then follows the plough, disturbing the ground another 6 to 7 inches, or deeper. About 60 acres were thus prepared at the State Viticultural Station, Howlong, in 1899 and 1900. Reference to this work done on the first 31 acres will be found in the December, 1902, number of the *Agricultural Gazette*.

When the reconstruction of the French vineyards became urgent and imperative, and the requirements of the phylloxera-resistant stocks as to the depth to which it was necessary to disturb the soil were understood, steam ploughs and subsoilers were called into requisition to save time and labour. There are several patterns of them, and I advise my readers to consult a pamphlet on the subject by Monsieur Paul Ferrouillat, Professor of Rural Engineering, at the Viticultural College, Montpellier; translated into English by Monsieur R. Dubois, late Viticultural Expert, Victoria.

(To be continued.)

The Passion-fruit.

W. J. ALLEN.

ALTHOUGH this fruit is not grown so extensively as it should be throughout the many districts on the coast where it will do well, it nevertheless plays quite an important part in some of the young citrus orchards in the County of Cumberland, on the Penang Mountain, and around the Gosford district, where it is frequently planted among the trees. As it begins to bear very early, growers are enabled to make considerably more from this crop than pays for the working of the orchard until the young trees begin to produce crops of fruit, which they invariably do after the third or fourth year.

Generally speaking, the vines are most productive before having attained to four or five years of age. After that period they begin to lose vigour and gradually die out, or cease to be very profitable, and are in consequence removed. The trellis and wires which were used for their support are removed from among the trees, and in many instances are used for a similar purpose in a new portion of the orchard which the grower may be planting out, as a great number of growers who possess fair-sized holdings are continually clearing more land and increasing the size of their orchards.

The passion-vine is found to thrive well on many classes of soil—some so poor that one is led to wonder how anything could be profitably grown on it. On the light sandstone and poorer coastal country there is no other fruit which will give the same return as this, and with proper working and heavy manuring, it is wonderful the amount of fruit that can be taken from an acre of such vines. The area planted is comparatively small, and, in consequence, the fruit usually commands very high prices. As an addition to a fruit salad there is no flavour that can surpass it, and when eaten with cream it rivals the most delicious of strawberries. If this fruit were known in Great Britain and America, I venture to say that there would be an unlimited demand for it, if once we were successful in landing it in those countries in large quantities.

Some few years back a few cases were packed and exported, arriving in London in good condition, but somewhat shrivelled, and, in consequence, when put up at auction were sold at a very low price, owing to the fact that the trade did not know the fruit, and imagined them worthless, owing to their shrivelled appearance. Later on, however, a gentleman from Australia seeing them, introduced them among some of his friends, who thereupon bought them readily at a high price per dozen. However, at the present time the supply is not equal to the demand, and in my opinion if twice the quantity were grown it would command good prices.

Location of Vineyard.

In selecting a site for the planting of a vineyard, one of the important points to keep in view is to avoid a district or situation where frosts are at all severe or of frequent occurrence in the winter. There is one thing which this vine will not stand, and that is severe frosts; and the Easter, winter, and spring crops are those which are in most demand. During the summer time there is a superabundance of other fruits, and hence the consumption of the passion-fruit is not so great, but from Easter until Christmas time there is a splendid market for all well grown fruit. It is during part of this time that we have our coldest weather, and a severe frost or two would destroy the whole crop, and in all probability kill the vine back to the root.

The chief feature about the passion-vine, however, is its habit of producing two crops per annum. The summer crop comes in about February or March, when the market is usually well supplied with other fruits, and prices are necessarily low. The winter crop is ready for pulling when other fruits are not so plentiful on the market. The practice of the growers, has, therefore, been to secure a heavy winter crop by pruning away the summer crcp when about half grown; or generally speaking, about the month of November. This stimulates the vines to throw out fresh fruiting laterals for the winter.

The next point of importance is to put the land in thorough order before planting, and in places where it is very sour and deficient in lime, which it mostly is on our coastal country where the passion-fruit is grown, it would be advantageous to give the land at least half a ton of good lime to the acre.

Planting.

The vines should be planted out about August or September, when the ground is in good condition.

In raising or purchasing young plants, either secure the seed from the very best fruit which has been raised on good, strong, healthy vines, or buy plants from a reliable person who has been most careful in his selection, and in this way avoid, as far as possible, starting the vineyard with plants which might perchance have any hereditary weakness. Plants usually cost from 6s. to 12s. per 100.

The seed is sown in February. The rows should be 30 inches to 3 feet apart, and the seed every inch or so in the row, afterwards thinning out to 3 inches apart to make good stocky plants. One half-case of fruit dealt with in this way is sufficient for planting an acre.

The trellis on which the vines are to depend for support might with advantage be erected just before the vines are planted, as by so doing the poles or stakes up which the vines are to climb, until they are firmly fixed to the wires overhead, might be placed in the hole in which the vine is planted, and the top of same secured to wire at the top.

In erecting the trellis, the posts should be 6 feet 6 inches long, firmly set to a depth in the ground of 18 inches, and placed at distances of about 24 feet apart, or at furthest 32 feet in the row. On the tops of these posts are tightly stretched, at a distance of 6 inches apart, two strong No. 8 galvanized-iron wires. The rows should run north and south, so that they get the sunlight on both sides. The rows are placed in the centre of the tree rows, or when alone, 10 feet apart, with the vines every 12 feet in the row, thus requiring about 363 plants to the acre.

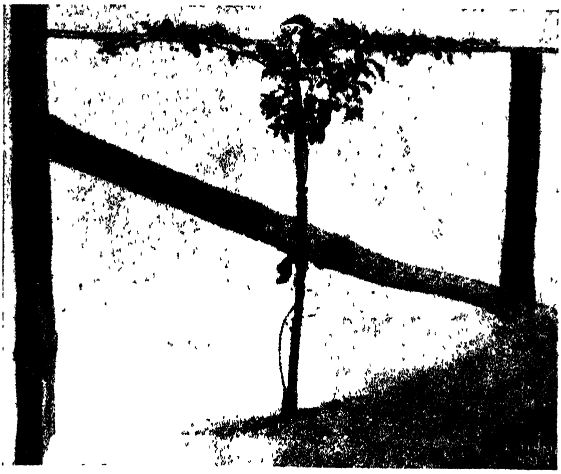


Fig. 1.

The young vine is trained with a single stem up the stakes until it reaches the wires, when it is allowed to throw out from two to four leaders, which are trained to run either way on the wires. (See Fig. 1, which is a vine showing first summer's growth.) As the vine puts forth further growth, the main leaders and laterals are trained along the wires, and after the second summer's growth it presents the appearance of Fig. 2, which it will be observed is carrying a heavy crop of fruit.

Fig. 2.

Manuring.

Without judicious manuring there are very few districts where the growing of this fruit would prove highly satisfactory, while, on the other hand, those growers who are giving the most attention to this important adjunct are the ones who are making the greatest profits out of the industry. It has become a recognised fact that liberal dressings of manure must be used from the time of planting until the plants cease to be productive. Generally speaking, the stronger and more vigorous the vine the sooner it begins bearing, the better are the crops, the life of the vine will be prolonged, and naturally the plant will be more healthy than if poorly nourished.

On making inquiry among the different growers, I found that scarcely any two of them were using the same mixture. Some, on the lighter soils, were using considerable quantities of blood and bone with a little potash; others were using bone, superphosphate, and potash; while others were using a mixture of nitrate of soda, dried blood, superphosphate and sulphate of potash, &c., &c.; and judging from the appearance of the different vines, all with very gratifying results.

Mr. F. B. Guthrie, Chemist of this Department, gives the following in his Bulletin No. 17—"Formulæ for Preparing Fertilisers":—

For Passion Vines.

From a number of experiments carried out with the manuring of passion-vines in the Glenorie (Cumberland) district the following mixture was found to be the most satisfactory:—

	Quantity per half-ton.	Cost. £	s.	d.
Sulphate of ammonia	5½ cwt.	3	11	6
Superphosphate	3 cwt.	0	15	0
Sulphate of potash	1½ cwt.	1	0	3
	10 cwt.	£5	6	9

This mixture contains—

Nitrogen ... = 11 per cent.
Phosphoric acid = 5 per cent. (all water-soluble).
Potash ... = 7·8 per cent.

This is applied at the rate of 4 lb. to each vine. Each vine will thus receive—

7 oz. nitrogen,
3¼ oz. phosphoric acid,
5 oz. potash,

at a cost of under 5d. per vine.

When the fruit begins to ripen it should be picked at least twice a week. It will keep well in a cool dry place, but I would recommend marketing every week.

Grading and Packing.

All badly formed and inferior fruit is discarded, and the better fruit is mostly packed in layers, so that when opened at the markets it presents a good appearance. In grading, colour as well as size are taken into consideration, any badly coloured fruits being sorted out and packed separately.

The quality of the passion-fruit grown in this State is all that can be desired, but the industry does not receive the attention it deserves, and growers might, with advantage, turn their attention more to the production of this popular fruit.

In conclusion, the passion-vine, provided the site and soil are suitable, is easily grown, cheaply maintained, and forms a valuable means of providing early returns until the orchard begins to bear.

There is no question that very creditable work is being done by many of the Cumberland growers, all of whom show that they have a proper grasp of their work, and that they find fruit-growing in the Cumberland district a very profitable industry. Most of them are large growers of citrus as well as passion-fruit, and they keep themselves thoroughly abreast of the times. There are many such growers throughout the same county who take a pride in their orchards, and the quality of the fruit which they are able to put upon the market, and who at the yearly balancing of accounts, find that their labour has not been in vain, but that the balance in the bank has been very materially increased.

WOODINESS OF THE PASSION-FRUIT.

[By Dr. N. A. COBB, *Agricultural Gazette*, April, 1901.]

This is a diseased condition of the passion-vine and its fruit which has caused considerable trouble during the past few years. Most of the complaints have come from the County of Cumberland, though the disease is known beyond those limits. It is so severe in some parts of Cumberland County as to have caused the cultivators to appeal often to the officers of the various Agricultural Departments in Australia, in the hope of getting information that would lead to a cure for the trouble. The present contribution aims to briefly summarise what is so far known about the disease, and to add a few new observations.

History.

"Woodiness" has been known in New South Wales for twenty years or more. As long ago as 1893 notices of the disease appeared in the newspaper press of this State. At that time the loss was not so great as now; or at least, if it was, the growers failed to make the fact known. It seems that no serious consideration has been given the disease outside this State.

Occurrence.

While scattered vines suffering from woodiness may be found all over the district where the fruit is grown, the loudest complaints have come from Dural, Galston, Arcadia, Glenorie, Kenthurst, and Gosford.

Whole vineyards may suffer so severely that hardly a vine escapes, and most of the vineyards in a given locality may be afflicted, but it is more common for some vineyards to escape, and for some vines in a diseased vineyard to escape. Single vines may be "woody," and their neighbours escape. Isolated vines may become "woody." The disease may cause much loss on vines in one part of the year, and yet the same vines may do comparatively well during the remainder of that year. The disease is less common and less serious on soil suited to the passion-vine than elsewhere.

Losses.

The losses due to the disease are difficult to estimate. There are no reliable statistics relating to the passion-fruit industry as a whole, and there are no statistics relating to "woodiness" that are any more definite than those given above. There can be little doubt that in some seasons we have witnessed a loss in Cumberland County reaching several hundred pounds sterling. This loss has been distributed over a score or more of vineyards; the owners, however, can ill afford the losses.

Outward Appearance of the Disease.

"Woody" passion-vines have an unhealthy outward appearance. The colour is a more or less yellowish-green, instead of dark green as in healthy vines. The leaves are often undersized, distorted, and spotted, and the branches are more or less twisted and crooked. Enlargements of the stock are common, and these enlargements partake of the same woody nature as the abnormal growth in the rind of the fruit noticed later on. Much of the fruit falls long before maturity, and that which hangs on and grows becomes worthless on account of that feature of the disease which must be best known to consumers, and from which the disease derives its common name, that is to say, the absence of edible pulp and a certain *woodiness* of the rind. Every lover of this fruit must have come across samples that resisted the fruit-knife, as if reluctant to yield up their miserable secret, which, after a struggle, proves to be the absence of anything edible.

Disappointment will have lent point to these recollections, and gives me a chance to fix on the reader's mind this leading feature of the disease.

If such diseased fruits are cut open when half-grown, they will be found to be thick-walled and nearly empty, the sub-microscopic seeds having been imperfectly fertilised or not fertilised at all. The space ordinarily filled by the pulp is occupied by air only. The non-fertilised seeds, when young, have a transparent or glassy appearance, and they have, moreover, failed to keep pace with the growth of the remainder of the fruit.

The ripe fruit presents appearances in accord with those just described as being prevalent in the green fruit. It feels hard, offers a very firm resistance to pressure of the fingers, and on being opened discloses no pulp or only a few abnormally yellow "seeds," and a rind whose cross-section is abnormally dark purple. As it approaches ripeness such a fruit may crack on the surface, and these cracks are a characteristic feature of the disease. As woody passion-fruit often reaches full size, consumers will not fail to note the temptation to place such fruit on the market, a fraud that is practised with success.

Some of the fruit on a diseased vine, namely, that which is less severely smitten than the rest, may contain a little edible pulp, but such pulp has a flat taste, and has a colour different from that found in healthy fruit. Instead of black seeds enclosed in a yellowish pulp, we find black and undersized seeds in an orange-coloured pulp. This leads us to a more careful examination of the seed.

The seed of this undersized woody fruit is invariably smaller, and, moreover, lighter in weight than sound seed. If the seed of healthy passion-fruit be placed in water it will be found to sink; if, now, the same experiment be tried with the seed of a "ripened" woody passion-fruit, a good deal of the seed will be found to float, often as much as one-third showing this tendency. Along with the black seed of woody fruit will be found a considerable quantity which has failed to blacken; such seed invariably floats in water.

It goes without saying, that woody passion-fruit is light in weight. This, of course, follows from the quantity of air which it contains.

Just before ripening, all woody passion-fruit takes on an unnatural green colour, this being no doubt a function of the same factors that produce the unnatural purple colouration that succeeds it in the ripe fruit. Cracks are not uncommon on the fruit at this stage.

Seedling passion-vines also exhibit the disease woodiness. In their case, however, the appearances are not so readily observed, partly because of the absence of fruit and partly, it may be, because the disease is one primarily of the mature plant.

Cause of the Disease.

From the evidence already presented we may justly draw certain conclusions that will aid us in a further study of this disease. In the first place the fact that the seed is not properly fertilised in woody fruits, points clearly to a cause antecedent to the blossoming period. Some diseased condition must have been present at or before flowering time, otherwise we should find normally fertilised seed. If now we add to this evidence the fact that seedlings are often woody, we take another step (a less certain one, it is true) in the same direction, namely, toward a consideration of the seed. When we have arrived at a consideration of the seed as a possible cause in the propagation of the disease, we are at once confronted by the thought that the seed of woody fruit is itself diseased. Have we not here one of those not infrequent cases of growers unwittingly actually propagating the very disease from which they are suffering? However, let us not come to this conclusion without a careful consideration of the facts.

Supposing woodiness to be a disease which can be transmitted by seed, would it be easy for a grower mistakenly to propagate it? In trying to answer this question, we must assume that every grower would, by preference, sow good seed, and we can, therefore, only suppose him to sow diseased seed by mistake. Would it be easy to make a mistake of this kind? By appealing to the now known facts, I consider it not difficult to show that such a mistake could easily occur. We find on many diseased vines, fruits apparently sound which yet do show slight traces of woodiness. What is to prevent a grower from selecting from among such a fine-looking, but really diseased, fruit for seed? If he did so, there is every reason to believe that disease would appear on the resulting seedlings.

Do we find in diseased vineyards any facts that are not in accord with this theory? So far we do not. On the contrary, we find a number of facts that are in close accord with it. All the facts given under the headings History and Occurrence are in accord with the supposition that the disease may be propagated by seed. By this we do not mean to imply that the disease is probably always so propagated, but that the probabilities are so great in that direction that we should, in starting new plantations, be careful to see that the seed is of the very best quality, and that it comes from plants free from any suspicion of woodiness. Furthermore, in all future investigations of this disease attention should be given to this possible transmission of the disease by means of the seed.

What we have thus far said on the subject of the cause of the disease has been of a somewhat speculative nature. Let us now turn to actual disease-producing factors. Mr. W. J. Allen sums up his observations under a number of heads, as follows:—

Exposed Positions.

In a few instances I saw vineyards situated in very exposed positions, and where they were subjected to very heavy winds, which are detrimental to vineyards, and particularly to those planted on indifferent soils, where the growth is less vigorous and less able to withstand the strong winds. The consequence is that vines planted in such positions and in such soils have, after the first year or two, borne more or less valueless fruit.

Frosts.

In some districts frosts are of frequent occurrence during the fall and winter, and these are very severe on passion-fruit, often causing the vine to lose nearly if not quite the entire crop, and also causing the stock, &c., to split open and crack in different places, and the undergrowth and small lateral branches to die.

When cold winds and cool nights prevail at the time of setting—particularly at the time of setting of the summer crops—it is noticed that the yield has a large percentage of worthless fruit, especially so on old vines which have become impoverished through age or lack of proper fertilisers. The succeeding crop, viz., the autumn crop, is comparatively free from these worthless fruits.

Heavy, Cold and Poor Soil and Subsoil.

On such soils the vines have, after the first couple of years, steadily gone back, producing small crops of fruit, which in many instances are almost wholly worthless, especially in case of the Easter and spring crops.

Improper Fertilisers, or neglect to supply any.

Vineyards planted in any soil show signs of distress sooner or later unless they receive a liberal dressing of manure periodically, and it is claimed by some that rows which have been well dressed with kainit and other manures rich in potash have produced heavy crops of good fruit, while adjoining rows which were unmanured had a large percentage of poor fruit—in fact, the growers are at one in their opinion on manuring, and assert that to grow good crops they must manure, and that, where this important work is neglected, the vineyards soon weaken and cease to produce either good crops or good fruit, such as are generally taken from all vineyards the first year or two.

Insufficient Moisture, &c.

Many of the growers attribute the failure to the excessively dry summers which have prevailed lately in many districts, and say that the vines did much better with them those years when occasional soaking showers fell during the summer.

Soil and Position best adapted for the Passion-vine.

The soil which has been found best adapted for the growth of the passion-vine is a rich, loamy soil, or sandy loam with a good natural drainage. In these soils it will live and continue to bear good crops from six to ten years, and on such soils there is found the least diseased fruit. Vines may also be found doing very well on poor light soil; but when they have exhausted the soil, which they do in a year or two, they must be constantly manured to keep them in a healthy and profitable condition. These vines produce three main crops of fruit each year, and unless the land is very rich they soon exhaust themselves if not well fed.

The Life of the Passion-vine.

The age at which the vine produces the best fruit, and when least woody fruit is noticed, is during the first four years of its life-time. In some vineyards, on rather poor soil, a shorter period (from two to three years) exhausts its productiveness; while on good soils, or those which are well manured, there are vineyards which have produced good crops up to the time when they were twelve years old; but, generally speaking, the older the vineyard, the more susceptible it has shown itself to disease. It is, therefore, best to renew the vines before they become too old.

I do not consider this partial failure of the passion-vine in a few of the vineyards to be a very serious matter. Many of the vineyards have been planted among trees, and as soon as these latter attained to any size, there was not sufficient moisture to keep both growing properly, and the vines have become weakened, and suffered accordingly. In such instances a large proportion of the fruit has become diseased, and of no commercial value. The growers, however, are alive to the fact that they cannot continue to grow trees and vines together for more than three or four years without seriously damaging both the trees and the vines, and consequently many growers are now taking out vines from between bearing trees.

As this vine does particularly well under ordinary conditions, bearing three large crops of fruit each year—that is to say, is in an almost perpetual state of fruit-bearing—it is not to be expected that it can keep up this strain without the application of proper fertilisers; therefore, at least every year, suitable manures should be applied; and as potash manures have given good results, I would recommend their use.

Pruning should not be neglected, as an unpruned vineyard with a lot of dead and useless laterals furnishes a harbour for disease, and the unpruned vines do not continue bearing or growing so well as do those which are well pruned back once a year.

For the fungous disease which Dr. Cobb found associated with woodiness, I would recommend a spraying with Bordeaux mixture (summer strength) just before each of the main crops blossom, and another as soon as the crop is fairly well set. This would not be found very expensive, and should be the means of keeping the vines fairly clean of fungous diseases.

A DISEASE OF BANANAS.

SOME bananas were recently submitted to the Bureau of Microbiology affected by a fungus known as *Glœosporium*. The following report was supplied to the grower:—

> The fruit is often attacked in a very young stage, and the disease may extend through the whole bunch, causing the young bananas to shrivel, blacken and become worthless. The fungus is able to completely prevent the fructification of the banana.
>
> As the fungus attacks the fruit, some remedy is necessary that will not injure the young flowers and fruit as they are exposed. When the "hands" of the full bunch are exposed, they may be sprayed with an ammoniacal solution of copper carbonate. Mix 6 oz. of copper carbonate in a wooden pail with sufficient water to make a thick paste. Next add sufficient ammonia (about 3 pints) to dissolve the paste, and then add water to make up to 50 gallons. Follow the spraying with a second in about a week or ten days.

Importation of Ostriches from Soudan.

MR. T. J. HERBERT, who was employed by the New South Wales Department of Agriculture to obtain some ostriches from Northern Africa, which are now at Yanco Experiment Farm, has furnished a report on the trip which contains information of value to intending ostrich farmers.

At the time of his visit, Europeans were not allowed to proceed inland from the coast of Somaliland, owing to some European traders having caused eruptions among the natives. Ostriches are brought to the coast by native traders at irregular intervals, but Mr. Herbert was unable to arrange for inspection of any birds. He was informed, however, that the Somali feathers were not of good quality, and he afterwards saw specimens of Somali ostriches in Egypt and Germany ; the plumage was short in length and light in flue. Though crossing with Cape birds improves them, Mr. Herbert does not think it advisable to import Somali ostriches.

In Northern Africa, ostrich-farming is only carried on to a limited extent, and the system of handling birds and taking feathers is behind that of other countries. The wings and tails are plucked, not clipped, every six months, and on the approach of summer the whole of the body feathers are removed in the same way.

In British Soudan the exportation of ostriches is prohibited, so as to give local farmers an opportunity of securing stock. Since the prohibition of exportation from South Africa, there has been a great drain on the Soudan from America and elsewhere. Most of the feathers are obtained from wild birds shot by natives.

At Matarich, Egypt, Mr. H. Ekisler had 1,000 ostriches a few years ago, but lately, owing to prohibitions in other parts, he has done a lot of business in exporting birds to Holland, Russia, and even Norway. A shipment of 60 recently went to Tunis, to the order of the French Government. The ostriches on this farm are all of the Soudan breed. Somalis were tried, but were not a success. It was from Mr. Ekisler that Mr. Herbert afterwards purchased the birds which were brought to Yanco, and he makes the following remarks regarding the Soudan breed :—

> The Soudan ostrich differs from the Cape bird in the colour of the skin, which is white, and in the breeding season changes to a bright red ; and again differs by having a bald head. This baldness also applies to the Somali bird, whose skin, however, like that of the Cape ostrich, is blue, only the beak and the lower portion of the legs being red.
>
> I find that the Soudan birds carry a fine quill. This is an essential in which the greater portion of the birds we have are lacking. They have also a nice round shaft and fairly broad flue ; but the system adopted of plucking the feathers every six months is not conducive to the growing of good plumage.

Mr. Herbert also visited ostrich farms at Jaffa, in Palestine, and at Nice, in the South of France, but no birds were for sale. At Nice is a branch of the Causton Ostrich Farm of Passedena, California. The birds were originally of the Cape strain, from California, but lately new blood has been introduced from North Africa. Eggs are hatched with Petaluma incubators, and the birds are kept in small areas and hand-fed, chiefly on chaffed clover, bran and barley.

At Mr. Carl Hagenbeck's farm at Stettingen, near Hamburg, Germany, Mr. Herbert saw 200 birds of five varieties of ostriches—Senegal, Soudan, Somali, Cape, and German East African; but only the Somalis were for sale. The Senegal birds were fully double the size and weight of any others he has seen, and he thinks the progeny are more hardy and vigorous, though the plumage may be no better than that of smaller birds. At this farm the birds are housed in sheds at night in winter, and incubation with Petaluma machines is practised. The birds refuse to lay under cover, and insist upon being out in the open despite all climatic conditions. Hamburg has a cold, wet climate, with very little sunshine even in summer, and heavy snows and as much as 40 degrees of frost in winter. When the ground becomes covered with ice after rain, sand is thrown on the surface, the birds being left out in sunshine, rain or snow. "After this," says Mr. Herbert, "I agree with Professor Duerden when he says that ostriches will thrive and flourish wherever lucerne will grow."

In London Mr. Herbert visited the auction rooms of Messrs. Lewis and Peate, the principal feather-brokers of the world. Here he saw £300,000 worth of feathers, principally from the Cape. He makes the following remarks:—

> Long whites, feminas, blacks, drabs and splendonas were being sorted and got ready for the auction sale, about a fortnight hence. The feathers are classed as first whites, second whites, and broken and inferior, and catalogued accordingly; then feminas, first, second, broken and inferior; drabs and blacks are sorted into two classes, long and short; byocks and splendonas being sold separately.
>
> The feathers arrive packed in cases, varying according to the size of the consignment. Moth balls, which are placed among the feathers in the case, are the only precaution taken to prevent vermin from getting in. Hessian is tacked over the case; it is then wired up, sealed and branded.
>
> Brands or trade marks should be registered in London. This is very important to the man whose feathers are sorted without the intention of defrauding the purchaser, as unscrupulous vendors place short and broken feathers in the middle of bunches, with feathers of a superior quality on the outside of the bunch. The dealer or dresser buying a consignment of feathers never forgets to note the brand, and if it is found to be squarely sorted will endeavour to get the same brand again when it is placed on the market.
>
> It was very encouraging to learn that the class of feather grown in Australia has gone up 100 per cent. since the introduction of the lancer plume, while the price of the best whites grown in South Africa has become cheaper

Mr. Herbert had some difficulty in arranging for a ship to pick up the birds; eventually the P. and O. Company's intermediate steamer "Palermo" took them. Two pens were constructed on board at London, and six birds were carried in each pen. The birds were picked up at Port Said on 29th July. They had to wait five days in a cattle truck for the steamer, and were conveyed on a lighter and hoisted on deck, three at a time, in a specially constructed box. The ostriches had then to come through the intense heat of the Red Sea; the monsoons to Colombo; then torrential rains washing over the ship for days; a heavy sea smashed in one pen, but this was repaired without damage to the birds; and after a heavy swell across the Bight, the birds were landed at Melbourne on 2nd September and railed to Yanco without loss of life. Unfortunately, however, two male birds died as a result of the hardships *en route*.

The Plucking of Ostrich Plumes.

ALLEGATIONS OF CRUELTY.

J. E. DUERDEN, M Sc., Ph.D., A.R.C.S., Professor of Zoology, Rhodes University College, Grahamstown, South Africa.

It has been brought to the notice of the Government of the Union of South Africa that allegations of cruelty in the plucking of ostrich feathers are frequently made by Societies and individuals abroad, tending to bring discredit upon the ostrich industry and the farmers engaged therein. Such assertions can only be made in ignorance of the actual feather operations, or from prejudiced interests. The following account of the processes of taking the feathers has therefore been prepared, in order to show to your readers how utterly groundless are the charges from a physiological point of view. As a professional zoologist, the writer has been engaged upon the study of the ostrich for over six years, in the course of which he has carried out all the farming operations involved in the management of hundreds of birds.

At one time, ostrich plumes were all procured from wild birds, which were hunted and shot entirely for the sake of their feathers. Forty-five years ago wild ostriches were first brought under farming conditions, and to day the farming of the domesticated bird is one of the most important agricultural industries in South Africa, the annual export value of the plumes reaching two and a quarter million pounds. Wild feathers are now rarely exported, the number having decreased year by year as the wild bird has become extinct or restricted to remote regions. To-day the number of domesticated ostriches in South Africa, all the progeny of original wild birds, is nearly one million.

The first feathers are taken when the ostrich is six months old. By this time the twenty-five or so plumes on each wing, technically known as spadonas, are ripe, and are clipped with ordinary pruning shears. Ripeness of a feather implies that the plume part is completely unfolded, and the blood drained away from the nourishing pith or medulla of the feather into the quill below, which is still growing. To allow the ripe plume to remain on the bird until the quill is ripe, would result in a serious deterioration from wear and tear and climatic influences. No exception on the score of cruelty can possibly be taken to the clipping of the ripe feather from the quill. Any physiologist will admit that it certainly means no more to the bird than the trimming of the nails or the cutting of the hair to a human being, or the shearing of wool from sheep. All these are epidermal or skin structures, and as such are devoid of nerves and blood vessels, being made up of dead cornified cells.

The quill portion of the feather left in its socket requires two months in which to complete its growth and ripen after the plume is clipped. Left to nature, the old quills would then be slowly pushed out by the growth of the new feather below. The new feathers would, however, appear unevenly, not simultaneously, and the whole endeavour of ostrich management is to secure a full and complete crop of wing feathers, for only then are the plumes of the best quality and suffer the least deterioration during the progress of growth. To secure this even crop it is absolutely necessary that all the quills when ripe should be artificially drawn at the same time, as it is then found that all the new feathers commence their growth at one and the same time and mutually protect one another. The short feathers—blacks, drabs, and tails—are either clipped or plucked after the quill is ripe.

Of all the operations involved in ostrich management, it is only to the drawing of the quills that the least suggestion of cruelty can possibly be attached. It is, however, merely performing for the bird what he himself would carry out, though in a more leisurely and irregular manner. When extracted, the quills are ripe and therefore dead, with all the blood and nerves withdrawn, and it is difficult to conceive that their pulling out means little more to the bird than the removal of our own dead hairs in the daily process of brushing the head. To extract the quill before ripe is found to diminish the quality of the new feather. We can only judge of the feelings of the lower animals, as well as of other human beings, by observing their external manifestations, and when it is seen that an ostrich will stand quietly while its ripe quills are drawn one by one, without any response whatever or symptom of irritation, it is impossible to conceive how even the most sensitive person can associate an idea of cruelty with the operation.

Six months after drawing of the first quills—this is, by the time the ostrich is 14 months old—its second crop of feathers is ripe. These feathers are much larger than the first lot, being nearly mature plumes. As before, the wing feathers are clipped and the quills left for another two months to ripen, when in their turn they are extracted, and the third crop commences to grow. On the coastal districts of South Africa, where the distinction between summer and winter is not pronounced, and food is plentiful all the year round, it is possible to secure a crop of feathers every eight or nine months, while in the higher, colder parts, only a yearly crop is obtained, the quills being allowed to remain in the sockets five or six months after the plumes are clipped. After feather maturity is reached at the third crop, an ostrich will continue to give good clippings for many years. Individual birds are known to be at least 40 years old, and are yet in full feather-bearing condition, and also breeding—undoubted evidence that the restraints and operations of domestic life involve no great departure from nature.

Both farming experience and experiments have abundantly demonstrated the close connection between a high nutritive condition of the ostrich and the production of a perfect crop of feathers, and also the necessity for the most careful treatment in clipping and quilling. The greatest care is taken to maintain the bird in full vigour by lavish feeding on irrigated crops of lucerne or rape. Any neglect or mismanagement may mean the deterioration of the crop, and its reduction in value from £10 or £20 to £2 or £3. The whole of the physiological conditions of the growth of a perfect crop of ostrich plumes are such that the farmer has no option but to provide the birds with the best conditions possible, and to exercise the greatest care in growing the feathers. It can with confidence be claimed that no domestic animal leads such a pampered existence as the South African ostrich from the day it is hatched until, at some dim and as yet unknown distant future, it succumbs to old age

Statistics are available as to the export of ostrich plumes from South Africa for the past seventy-five years, and show a steady increase throughout, until last year they amounted to 326,992 lb., proving the ever extending adoption of the ostrich feather as an article of adornment. The meditative wearer of the graceful plume has the satisfaction of reflecting that no hint of cruelty can possibly be involved in its production, and that the decrees of fashion have saved from extinction one of the most ancient and most fascinating of all the feathered tribe, and given it a place among the most cared-for and favoured of animals.

"SOOTY MOULD" OR "FUMAGINE" ON ORANGES.

THIS disease is attacking orange orchards in the Gosford district. Specimens were recently submitted to the Bureau of Microbiology, when the following report was furnished:—

> The fungus present is *Caprodium citricolum*, which forms the "Sooty Mould," "Fumagine," &c. It may occur on leaves, branches and fruit, and is entirely superficial, and usually follows the attack of some insect pest.
>
> The treatment recommended by Mr. McAlpine is as follows:—
>
> 1. Prune off branches badly attacked with sooty mould, and burn.
> 2. Systematically prune and burn all water shoots at the beginning of each spraying season.
> 3. Spray with Resin Wash. This has been found to give uniformly good results. The best time to spray is when the larvæ of the scale are on the move. As this spray is easily washed off by rain, it should not be applied during rain, nor when rain is likely to fall within two or three days. The dense foliage of citrus trees renders them rather difficult to spray, but it is a good practice to trim out the tree from within. As it is absolutely necessary to wet the under surface of the leaves, the operator must get under the tree and spray outward as well as from the outside. Plenty of the material should be used, on an average from 2 to 4 gallons per tree, or more according to size.
> 4. Fumigation with hydrocyanic acid gas, by means of tents covering the trees, has been found effectual. This gas is an animal poison, and does not seem to be effective against fungi; but in this particular instance it rids us of the fungi by destroying the source of its food supply, viz., the scale insects. Forty-minute treatments have given good results.

Leaflets dealing with Resin and Soda Wash may be obtained from the Department of Agriculture, Sydney.

Lime-Sulphur Spray.

[By A. L. Quaintance and W. M. Scott, United States Department of Agriculture, in *Better Fruit*.]

DURING the last few years there have been important improvements in the field of orchard spraying as regards the materials used and also in the character of machinery employed. At the present time orchardists, by careful attention to details, are able to obtain a much higher benefit from spraying operations than formerly, and while results vary, depending upon weather and other conditions, yet the successful orchardist now expects to harvest, as sound fruit, from 90 to 95 per cent. of his crop. Fruit-growers have now become quite familiar with lime-sulphur sprays as a remedy for the San José scale, peach leaf-curl, and blister mite, and other troubles requiring dormant tree treatment. The lime-sulphur wash, as used on dormant trees, has gone through a good deal of evolution since the California formula was first employed in the East. Whereas a few years ago it was the practice to make the wash at home for immediate use, utilising for this purpose in many cases very large cooking outfits, the tendency at the present time is toward the employment of the commercial lime-sulphur solution, a concentrate which is kept indefinitely and used as needed, or similar home-made solution, both of which are prepared on a distinctly different formula from the wash as formerly used. A distinct advance was made in the control of fungous diseases when it was found that these commercial and home made lime-sulphur concentrates, properly diluted, could be used with satisfactory results as fungicides on trees in foliage, replacing Bordeaux mixture, the use of which is attended with danger of russeting the fruit and injuring the foliage, depending upon weather conditions.

Home-boiled Lime-Sulphur Solution.

Concentrated lime-sulphur solution, to be diluted and used for the summer spraying of orchards, may be prepared by boiling together for about fifty minutes 100 lb. of sulphur, 50 lb. of lime and water to make 50 gallons of concentrated solution. Any finely powdered sulphur of 98 to 99 per cent. purity may be used. The commercial ground sulphur is the cheapest form, and is as good as the flowers or flour for that purpose. The best grade of fresh stone-lime is required for the best results, although a good grade of hydrated lime may be used, provided proper allowance be made for the high percentage of moisture it contains. The boiling may be done in barrels or vats with steam or in kettles over a fire. An ordinary 75 to 100 gallon food-cooker, composed of a kettle with jacket and fire-box, is perhaps the most convenient and economical outfit for small and medium-sized orchards. Place about one-fourth of the required amount of water in the kettle, bring it to the boiling point, then put in the lime and immediately add the sulphur Stir vigourously until the lime is slaked, then add sufficient water to finish with 50 gallons of the concentrated solution, and boil for fifty minutes. The total time of actual boiling should not exceed one hour, and as a rule a boiling period of only fifty minutes gives better results. After the sulphur has gone into the solution, combining with the lime to form sulphides, further boiling brings about a chemical change which finally results in throwing some of the sulphur out of the solution to form a sediment. The sulphur should first be passed through a sieve to break up any lumps that it may contain, and there is perhaps some advantage in working it into a thick paste with water before adding it, or the sulphur may be placed in the kettle first and worked into a paste before adding the lime. In order to finish with 50 gallons of solution the kettle should be filled to about 58 gallons, on account of evaporation. If the water evaporates to below 50 gallons, more water should be added to make up the loss. A measuring-stick with a 50-gallon mark, and other marks as desired, will be found useful in determining the amount of liquid in the kettle. When steam is used the process is about the same as above described. Owing to the condensation of the steam, a somewhat smaller amount of water is required. When the boiling is finished the solution should be poured through a strainer of about twenty meshes to the inch, so as to remove the coarse particles of sediment. It may be used immediately or stored in barrels or other containers and kept indefinitely, provided the air is excluded. In practice the fruit-growers as a rule have not been able to prepare the lime-sulphur solution without obtaining a large amount of sediment, and this has tended to make the commercial product more popular. The sediment is largely due to impurities in the lime and improper mixture and boiling. Straining will take out the coarser particles, and the remainder will not prove to be seriously objectionable. After the sediment has been settled the clear liquid should test 25 to 28 degrees on the Baume hydrometer. It takes about 2 gallons of the home-made preparation to equal in strength 1½ gallons of the commercial product, and these amounts, respectively, are the amounts required for each 50 gallons of spray. For the summer spraying of apple trees, lime-sulphur solution, whether home-made or commercial, should be so diluted as to contain 3½ lb. to 4 lb. of sulphur in each 50 gallons of spray. Prepared according to the above directions, 1 gallon of the home-made product contains approximately 2 lb. of sulphur in solution, and therefore 2 gallons would give the requisite amount of sulphur for each 50 gallons of spray. For spraying trees during the dormant season it should be used much stronger, 12 lb. to 15 lb. of sulphur to each 50 gallons of diluted spray being required. For dormant tree spraying, about 7 gallons of the home-made solution in each 50 gallons of spray would, therefore, give the proper strength.

Commercial Lime-Sulphur Solution.

For some years manufacturers of insecticides and fungicides have had on the market concentrated solutions of lime-sulphur, originally designed as treatment for the San José scale, which obviated the necessity of orchardists preparing the wash at home. These solutions have now come to have a much wider range of usefulness, forming a satisfactory substitute, in most cases, for Bordeaux mixture as a fungicide. These concentrated solutions for the most part are well made and are fairly uniform in strength, registering from 30 to 34 degrees on the Baume scale. Many orchardists prefer to use them rather than to prepare the spray at home. In the case of small orchards their use is doubtless advisable; but where the orchard interest is considerable, the fruit-grower might well afford to prepare the concentrate at home. In the use of the commercial lime-sulphur solution, as in the home-made solution, the orchardist should know rather exactly the proper dilution to make which will ensure the control of the troubles in view, and on the other hand not prove injurious to the foliage and fruit. Dilutions are based on the strength of the concentrate, as shown by its specific gravity. Thus commercial lime-sulphur showing a density of 32 degrees on the Baume scale should not be used stronger than 1½ gallons for each 50 gallons of spray. According to the writer's observations, a variation of 2 degrees above or below the density indicated is immaterial as regards danger of foliage injury, so that the recommendations hold for practically all of the commercial concentrates on the market. Where the fungous troubles to be treated are not very serious, it is recommended that only 1¼ gallons of the concentrate should be used to each 50 gallons of spray in order to eliminate, in so far as possible, the danger of injury to fruit and foliage.

CATERPILLARS ON GRAPE-VINES.

ARSENATE OF LEAD is the very best thing to get rid of the caterpillars of the common vine moth caterpillar. Use 2 lb. to 50 gallons of water. Arsenate of lead can be obtained as a paste, and simply needs dissolving in the water. When using, keep it well stirred, as it will otherwise settle to the bottom and give an uneven strength.

If making, say, 25 gallons, mix the 1 lb. of arsenate in a gallon of water and then make up to the full amount.—W. W. FROGGATT.

PROCLAMATION AGAINST SHIPMENT OF FRUIT TO WESTERN AUSTRALIA.

As the State of Western Australia is reported to be free from Codlin Moth, the Governor General has, by proclamation under the Quarantine Act, 1908, in the *Commonwealth of Australia Gazette* of the 21st September, 1912, prohibited the removal of apples, pears and quinces into Western Australia from any of the other States.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
Cardiff	Mr. D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. H. Vickers, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. T. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Frogmore	Mr. W. W. Thompson, Frogmore.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Kareela	Mr. L. Haydon, Kareela.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald. Keepit.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S Stening, Little Plain, *via* Inverell.
Lower Lawrence	Mr. E. T. Cooney, Lawrence
Lower Portland	Mr. G. Gosper, Lower Portland.
Mangrove Mountain	Mr. G. T Hunt, Mangrove Mountain, *viâ* Gosford.
Milbrulong	Mr. O. Ludwig. Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *via* Penrith.
Parkes	Mr. John E Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, "Vila," Penrose.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. J. E Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Samples of Wheat.

It has been decided to supply branches of the Agricultural Bureau with samples of grain and bunches of heads of the twenty-two varieties of wheat recommended by the Department for cultivation in various parts of the State. These comprise the leading varieties recommended for grain, hay, dual purposes, and green fodder. The collection should prove a valuable acquisition, especially for identification purposes, to members of branches in wheat-growing districts.

Secretaries intending to avail themselves of this offer are requested to make early application to the Department.

LECTURES AND DEMONSTRATIONS IN COURSE OF ARRANGEMENT.

Place.	Subject
Wolseley Park	Lecture on Dairying.
Balldale ..	Veterinary Science, Viticulture, and Lamb-raising.
Henty...	Veterinary Lecture.
Jiggi	Veterinary Lecture; Lecture on Agriculture.
Gunning	Practical Demonstration in Wool-classing.

REPORTS AND NOTES FROM BRANCHES.

Albury and District.

A new and very strong branch has been formed in the Albury District. The office-bearers elected for the ensuing year are Mr. F. Wells, Chairman; Mr. G. P. Frère, Vice-Chairman; Mr. H. Hogue, Treasurer; Mr. J. D. Lankester, Secretary. In addition, three assistant secretaries—one each at Thurgoona, Lavington, and Albury—were appointed.

Balldale.

Mr. Cuthbert Howard read the following papers :—

PREPARATION OF SMALL CLIPS OF WOOL FOR MARKET PURPOSES.

At the outset, I should like it to be clearly understood that this paper deals only with farmers' lots, as the preparation of wool is largely determined by the size of the clips.

Yarding of Sheep.—I have taken as the starting point the yarding of sheep. Do not yard the sheep more often than is necessary, or allow them to stand in a dirty yard, as by doing so the wool becomes dirty and, of course, less valuable.

Accommodation for Shearing.—If possible, have a shed with boarded floor, bins for the different kinds of wool, and grated pens for the sheep to stand in overnight. If you have to use a barn or other shed, see that it is clean. All chaff, straw and foreign matter that would adhere to the wool should be cleaned up. Light is, of course, absolutely necessary, as one cannot do anything in the way of preparing wool where the light is not good. The tables where fleeces are skirted first, should be 12 feet long and 6 feet broad and a convenient height ; the laths should be sufficiently far apart to allow of the locky bits, second cuts, &c., falling through. In no case should the table be placed against the wall or any other fixtures, as the wool-roller should be able to get all round to do his work properly. Skirt lightly but take off all locky bits, and keep the bellies by themselves or mix them with the pieces if they match. Stained pieces should on no account be mixed with any other wool or allowed to remain on fleeces or bellies. Urine-stained wool can never be scoured white. If by moderate skirting the fleeces can be kept free from burr or seed, by all means treat them so, but do not rob the fleece unduly. On no account put Merino and cross-bred wool in the same bale, and when dealing with cross-bred sheep of different grades, be very careful to keep the fine quality fleeces separate from the coarse. To explain what I mean : It has been noticed that some wools have to a certain extent been neglected by the leading buyers, namely, manufacturers from England, the Continent and America, on account of their unevenness in spinning quality. Wool is divided into counts, just as the alphabet is divided into letters. Each mill uses a certain spinning quality, and therefore cannot bid for any lot containing two or three qualities. For argument's sake, say a farmer's lot of 12 bales of cross-bred contains three of the commonest qualities, namely, 44, 50, and 56. There may be large orders in the market to buy 56, but buyers of same cannot possibly bid for the lot because it contains 44 and 50, and the same with buyers of 44 and 50. Hence the competition of the manufacturers is entirely lost, and the wool has to be bought by either top-makers, who sort the wool into spinning qualities, scour, and comb into Bradford tops, and presumably sell at a profit to the manufacturers ; or by local scourers who sort, scour, and ship to London for re-sale ; or by local dealers, who sort and re-sell in the grease in the market. Top-makers, scourers and dealers are all more or less middlemen, and only handle the wool to make a profit, and it is therefore desirable that producers' wool be put on the market in such a state that it will receive the attention of manufacturers at its highest market value. Keep separate all dingy fleeces. It is better to sell them by themselves than that the whole clip should be affected by them ; for it must be borne in mind that the men who are sent here to spend thousands of pounds are not "mugs," and if inferior wool is included it will naturally reduce the price. It is desirable to make every lot up to 4 bales, or over if possible, as lots of 3 bales and under are termed in the trade "straw lots," and, generally speaking, do not receive the same attention from big buyers if sold by themselves.

Weight of Bales.—Make all bales of greasy wool up to 200 lb. at the least, for if they do not weigh that the rules of the Association compel their being sold separately from the rest of the clip. At the same time, it is not advisable to make the bales too heavy ; a good average weight is 336 lb.

Branding of Bales.—This is very important. Be neat in the sowing and branding of bales, as the appearance of the bale when turned out is an index as to how the wool has been treated inside. Your initials over name of farm is the best brand. A stencil plate should be used when marking bales ; brand one end and one side. Number consecutively. A descriptive brand should be legibly marked on each bale, viz., "Hoggets," "Ewes," "Wethers," "Bellies," "Locks," "Lambs."

MACHINE SHEARING *v.* HAND.

In placing the subject before you I have tried to be as concise as possible, and not burden you with endless figures ; but there is always the expense to be considered, and as machines require power and expert supervision, it is generally believed that hand-

shearing is the most satisfactory for the small man. The consensus of opinion among stock-owners is that machine-shearing, if continued on the same sheep, tends to shorten and harden the wool. The reason seems to be because the vibration and close cut bruise the sheep more than the blades, and consequently injure the growth of the wool for next season. Again, weather conditions at shearing time often help to make the machines more expensive, for if you are shearing early in the season and get a cold snap, more machine-shorn sheep will succumb than blade, because of the closeness of the cut. Then again, if shorn in the end of the season, they are liable to become sunburnt for the same reason. Why some people continue the machines is because of the scarcity of blade men, for nearly all learners during the last few years have gone in for the machines, because they can shear more per day with them; and as shearing is paid by the 100, it is to their advantage to do so. The weight of evidence, as I have collected it, is against machine-shearing.

Bonville.

Mr. Veterinary-Surgeon A. E. Massy delivered a lecture to members of the above branch on "Contagious Abortion and Mammitis in Cattle."

Crudine.

A good attendance assembled at Crudine to hear Mr. R. G. Warry, Demonstrator in Apiculture, deliver a lecture on "Beekeeping," particulars of which will be published in next month's *Gazette*.

Cundletown.

"Mammitis and Abortion in Cattle" was the subject of a veterinary lecture delivered by Mr. A. E. Massy, M.R.C.V.S.

Coonabarabran.

The first meeting of the above branch was held in the Shire Chambers on Saturday evening, 7th October, with a good attendance of members.

A subject from the *Agricultural Gazette*, by A. H. E. McDonald, on "Harrowing of Wheat," was read by the secretary. The question was well discussed, many members speaking from experience in favour of the advantages gained by harrowing the wheat crops. Some members recommended rolling before harrowing, pointing out that so doing left the ground in better order for machinery during harvesting. One member, whose land had set hard with the late rains, said he noticed that a portion rolled was now ahead of that harrowed. A resolution was moved that he be requested to try three portions separately, first rolling, second harrowing, third rolling and harrowing, and to report results at next meeting. This the member promised to do.

A second subject, from the *Sydney Morning Herald*, on "Maize Production," was read by the secretary, who also suggested that the following questions may be a helpful guide in discussing the question:—

What may be considered a payable crop?

What are the best means to adopt to avoid the usual dry spell early in the new year?

What is the best variety to plant in this district?

It was held that nothing under 50 bushels could be considered payable. The second question brought forward good debate—early planting as against better cultivation—the early planters being in the majority. Iowa Silvermine and King's Early for early planting, and Clarence Wonder and Golden King for late planting, have given the best results, although a variety of Indian Dent (known locally as Brooks') has given exceptionally good results.

It was decided to set apart half an hour for questions at the conclusion of business at each meeting.

Subjects for next meeting:—

Mr. H. E. Crane to read a paper, "Crops Suitable for and the Making of Silage."

Mr. T. C Hutchinson to give a demonstration of the practical use of wire on the farm.

Forest Creek.

On 14th September Mr. T. B. Prosser read the following paper:—

WATER AND FODDER CONSERVATION.

That something in the way of both water and fodder conservation is necessary has been clearly proved by the experience of the dry spell we have just passed through. We have found that lean years occur frequently. Five years rarely pass over our heads but that we are faced with the problem of feeding at least some of our stock for a time during the winter months. Some of the lean periods are much severer than others, and very heavy losses have occurred at various times—notably 1898, 1902, and this year, 1912. This year there will be a loss of approximately ten millions of sheep and a considerable number of large stock. To this must be added the depreciation in the weight and value of the wool clip, which will be very considerable. It is reasonable to suppose that the State has lost during the last dry spell, which lasted from the 1st January to the 9th June, at least six million pounds sterling, or enough to build—if expended on such work—about 1,200 miles of the much needed railways. Such a disaster as this must set us thinking of some way to minimise the losses. Our scientific men have from time to time tried to forecast when these lean periods would occur, and to prepare people for them; but so far these men have not been successful, one advocating one theory and another another theory, and none of them giving us sufficient data to be of any service to us. Therefore, if anything is to be done to minimise these losses, we will have to do it ourselves by anticipating and being prepared for them when they do come, by conserving both water and fodder during good seasons.

On many of our holdings more water than what we have provided is necessary, and consequently losses very often occur through this cause long before the pastures are eaten out, and it seems to me that we would all do better if we conserved more water for our stock. The fact that stock have to travel long distances for water, or use very muddy or bad water, makes materially against their condition, especially when herbage is dry and pastures are becoming exhausted. On most of our holdings there are creeks and gullies—good catchment areas if they were only dammed or tanks were excavated in them to hold some of the water which runs to waste after each shower that falls. If this were done, I feel sure that on many of the holdings in this district the stock would thrive much better, at any rate during the dry weather, and if hand-feeding had to be resorted to the difference would be most marked.

Conservation of fodder, either as hay or silage, is, I suppose, the most important item in preparing to resist dry spells. In this district the natural grasses are not, in my opinion, of much value for hay, and hardly repay the trouble of gathering and stacking. The same remarks will, I think, apply to the making of silage. In the spring time our pastures are overrun with barley-grass or foxtail, which makes them unfit for hay, and as it is of low feeding value, it hardly repays the trouble of making it into silage. Some people tell us that anything in the shape of greenstuff will make good silage, but I cannot agree with that statement. My opinion is, and I am borne out in this by the experience of men who have given it a trial, that the better the quality, or the higher the feeding value of the fodder conserved, the more money there is in the undertaking. Hand-feeding in any form is expensive work, and to make it worth while we must get the best results possible, and these results can only be obtained by using the best feed we can possibly get. Therefore, if we think seriously about storing up for lean years, it will pay us to grow crops of undoubted value for that purpose. For the purpose of making silage, maize has, I think, proved a very valuable crop. Maize can be grown for this purpose on any of our wheat lands, and if planted in the season when the land is set aside for fallow, it would give good results and have a good effect on the land. The best crops of wheat that I have grown have followed crops of maize grown for green feed for sheep.

As to the cost of stacking or otherwise storing silage, I cannot give you very much information, for I have only tried it to a very limited extent, but I think maize can be made into silage as cheaply as any other crop.

Sorghums and millets are also crops which might be grown here, but do not, as a rule, grow so well, and are much more uncertain than maize. The first or spring cut of lucerne might also be proficably made into silage. The presence of barley grass or foxtail and other "seedy grasses" make it unsuitable, in many instances, for hay, but if made into silage this trouble would be minimised, and would be a good serviceable fodder.

For making hay, we all know the value of wheat, oats, rye, &c. The chief difficulty in holding a stack of this kind of hay is the trouble caused by mice, which is rather a serious one. Large quantities of wheat and oaten hay are destroyed every year by mice, and it is not an unusual thing to see hay stacks cut up into chaff and falling down through the ravages of this pest. Sparrows also damage haystacks by making holes through the covering and allowing the water to leak in when it rains.

Lucerne hay offers many advantages over cereals as far as its keeping qualities are concerned. Mice do not seriously injure it; in fact, mice are rarely found in lucerne stacks unless they are built in close proximity to other stacks infested by them. Lucerne has also the advantage of being very easily stacked compared with other hays. Anyone with an idea of what is required in stacking, and "an eye" for shape, can generally make a fair job of stacking lucerne hay. It keeps well in the stack. There is very little waste, and even if a little water finds its way into the stack, it does not injure lucerne to the same extent as other hays.

As to the feeding value of the different hays as determined by actual experience, there seems to be a great difference of opinion, but for feeding stock in the paddocks on anything like a large scale, lucerne hay is hard to beat. Of course, we have heard very much said and seen much written about a properly balanced ration for stock, but for the time it is necessary for us to feed our stock the properly balanced ration is not of so much importance as having sufficient feed of fair quality. Sheep, in fact any stock, running loose in the paddocks will always be able to pick up something which will help to balance the ration. Generally speaking, when the pinch comes and we find ourselves in the throes of a drought, we have not much time for preparing or mixing fodders, and much has to be done which would not be done in regular feeding. I do not claim to have had much experience in hand-feeding stock, but for feeding sheep in the paddock I have had better results from lucerne hay than from any other feed I have tried. If the lucerne hay can be damped with a little water before it is fed to sheep, it is much better, and if a little molasses is added to the water, so much better still. I think the damping could be done with the ordinary fire tank and hose by sprinkling it as it is scattered from the dray. This would entail more labour and would add to the cost of feeding the sheep, but I feel confident that the result would more than repay the extra labour and expense.

The cost of hand-feeding a number of sheep is considerable, and this is one of the things that is going to make silage unpopular. Where the forage has to be carted any distance, the extra weight of silage as compared with hay would be a serious drawback, as the labour entailed and the strength required in moving it would be so much greater.

There is an article in the August number of the *Agricultural Gazette* which gives a comparison of the weights and feeding value of lucerne hay and corn silage, which will give you a good idea of what I mean in this connection. The article referred contains the following statement:—"Land which will produce 10 tons of corn silage will produce 3 tons of lucerne hay per acre; land which will produce 12 tons of corn silage will give 4 tons of lucerne hay per acre. The ordinary cow will eat about 60 lb. of corn silage per day. The same cow will eat about 20 lb. of lucerne hay per day." According to these figures 4 tons of lucerne hay will feed a cow for the same length of time as 12 tons of corn silage, and an acre of lucerne will feed a cow for the same time as an acre of corn silage. Therefore, it is quite apparent to me that the extra weight of the silage would make it much more expensive to handle than the hay would be.

Those of us who have land suitable for growing lucerne (and experts tell us it will grow anywhere) would do well to get it under lucerne as soon as possible. There is another advantage in favour of lucerne-growing, and that is that there are always useful pickings in the paddocks after the last hay crop of the season has been cut, and this pick is very valuable to any kind of stock during dry spells. Lucerne will grow and send out green shoots even in the driest time.

There is just one other thing I would like to draw attention to. There are times when molasses can be purchased in Sydney for about £2 per ton or even cheaper. Seeing how valuable it is in times of drought, would it not be a good idea to purchase a ton and put it by for, not a "rainy day," but a dry time?

Frogmore.

The annual meeting of this branch was held on 10th August. The Secretary's report showed that nine meetings were held during the year, three papers were read, and two lectures delivered by Departmental officers. The branch was successful in having an experiment plot established in their district.

The following were elected office-bearers for the ensuing year :—President, Mr. J. B. Prosser ; Vice-President, Mr. J. G. Chudleigh ; Treasurer, Mr. S. Gee ; Secretary, Mr. W. W. Thompson.

Inverell.

At a well attended meeting of the Inverell Branch of the Agricultural Bureau, Mr. Arkinstall delivered a lecture on "Maize Culture."

Mr. Arkinstall said that two or three factors governed the production of a crop of maize, suitable soil and moisture being the most important. Nearly all the soil in this district would grow maize. The deep black soil required no manure, but the soil around Gilgai, or the sandy soils, would benefit by an application of manure. The first thing to do, to gain the best results, would be to send a sample of the soil down to the Department and get it analysed, find out what the soil was deficient in, and supply what was needed before planting the crop An auger should be used to get a sample of the soil, in order to secure a fair sample.

Having selected the land, the next item was the cultivation. Plough as soon as the crop was harvested, but not too deep the first time, which should be in early autumn. The weeds thus turned down would then have plenty of time to decompose before ploughing again, about the last week in August. This second ploughing should be about 6 or 8 inches deep. The next item was the planting, and varieties to plant. It was a good idea to sow all early maturing varieties, such as Pride of the North, Yellow Dent, or Prairie Queen. If sown in September, these varieties would tassel in November, and in nearly every instance would get beneficial rains about that time. Mr. Arkinstall did not favour sowing in October, as the crop would tassel in December, at a period when a dry spell was likely, but November was a good month to sow for the late crops. He had planted Funk's Yellow Dent in November, and harvested 30 bushels last year—the driest season on record.

Of the several methods of planting the best idea was a three-furrow plough, with corn-planter attached. Every farmer should have a corn-planter. The seed was dropped on the second turn, and covered with about 3 inches of earth. Another method was to make a drill, and cover with a cultivator, but in this case a light ploughing-in ensured a much better germination.

The next thing to decide was the distance to plant your corn apart. He recommended about 5 feet between the rows, and 3 feet apart in the rows, dropping either two or three grains each time. When planted singly in the rows from 15 to 18 inches apart, the plants grew suckers much more readily. Some growers preferred a large grain selected from the centre of the cob, but it had been proved that the seed at either end was just as good.

Another item well worth considering was the direction to plant the rows. The speaker advocated always planting north and south ; the whole crop would then be shaded by the rows. If planted east and west the sun would bake the soil from morning till night. It was not a good idea to force the crop too much at the start, as it would become too tender, and would not stand a check. Too much humus in the soil was not good for this reason. Mr. Arkinstall did not believe in hilling. He advocated simply using a little single-horse cultivator between the rows, and keeping all weeds clear till the crop was 3 or 4 feet high. In a wet season the hilling may be beneficial.

Mr. DITZELL congratulated Mr. Arkinstall on the manner in which he gave his experience of maize-growing. He had given the results of the Government plots, and of his experience as to early and late sowing, climate, soil and moisture. The speaker's experience had shown that the heavy flats produced heavier crops more consistently than the lighter soil, but one could not plough too deeply. He must plough early, and need not be afraid to plough plenty of rubbish under, as the elements of the season, such as frost and rain, would help to decompose the rubbish. September was too early to sow on the flats around Inverell. It might be all right on the high land, but all the flats were subject to frosts, and the corn would probably be cut down. From the middle to the end of October he had found the best time to sow. It was a big mistake to cultivate too deeply, and injure the roots of the crop. The higher the crop the shallower one must cultivate. He also disagreed with Mr. Arkinstall when he favoured sowing seed from the ends of the cob, and said if one wanted good plants he must sow a good plump seed, and seed true to type. Also, in connection with the rows lying in a certain direction, in his opinion, if the season was right the crop would be right also, and in the event of too much moisture it was a good thing to get the sun on the ground between the rows.

Mr. PENNINGTON believed in the check system. One then had rows in each direction, and could cultivate both ways, and it was very little trouble to plant the corn. The drills were made across the paddock, and in planting the seed was dropped where the drill-mark intersected the furrow.

Mr. MAIDENS wished to know if Mr. Arkinstall favoured taking the suckers away from the main stalks.

Mr. ARKINSTALL replied that personally he favoured having only one stalk with two good cobs.

Mr. MAIDENS said he had a share-farmer who believed in taking about 2 feet off the stalk.

Mr. ARKINSTALL did not favour the idea; he thought the tassel should be left on.

The debate then closed.

The debate for next meeting is on the general purpose sheep for the Inverell district, and will be opened by Mr. W. Maidens.

Katoomba.

The annual meeting of the above branch was held on the 12th September, and those elected to hold office for the next twelve months were:—Alderman George James, Chairman; Capt. H. Hicks, Vice-Chairman; Mr. James Knight, Treasurer; and Mr. Charles Wooller, Secretary.

Kellyville.

At the yearly meeting of the Kellyville Branch, the following were elected office-bearers for the ensuing year:—Chairman, Mr. H. Firth; Vice-Chairman, Mr. T. McIntosh; Treasurer, Mr. D. Kearney; Honorary Secretary, Mr. C. F. Boughton.

Leech's Gully.

At the monthly meeting of this branch, it was decided to procure two boards and hang them in the local hall, one to be headed "Wanted to Sell," the other "Wanted to Buy." Members having anything for sale or wishing to buy, can advertise their needs in this way. The principal object in view in connection with this is to co-operate in the purchase of good samples of grain for seed, or in fact anything that is used on the farm, such as implements, bags, manures, &c. Other branches might, with advantage to themselves, follow the lead of Leech's Gully.

Lower Portland.

The monthly meeting of the Lower Portland Branch was held on Saturday, 21st September.

Mr. G. Gosper read an interesting paper on Poultry Farming, pointing out the advantages of penned poultry over those with free range. The housing and yarding of poultry, and the most suitable breeds for laying and table, were dealt with. It was considered that laying breeds were more profitable than those for table use. The advantages of the Leghorn as a layer were strongly put forward. The marketing of eggs and the financial prospect of poultry-farming in general were also commented upon.

A general discussion on the paper followed, and very much interest was taken by the members present.

The president, Mr. R. Lowe, will read a paper entitled "The Horse," at the next monthly meeting.

On 13th September, Mr. J. G. R. Bryant delivered a lecture to members on "Fruit-culture."

Mangrove Mountain.

A lecture delivered by Mr. J. G. R. Bryant, Assistant Fruit Expert, was much appreciated by the members of the above branch. It is pleasing to note that the audience included a number of ladies.

Milbrulong.

The following paper was read by Mr. Rodgers, the chairman of the local branch of this Bureau:—

THE BREEDING OF FARM HORSES.

When breeding horses it is well to remember that one of the first essentials for success is to have a piece of land or small paddock in which to grow fodder crops. A plentiful supply of water is also very necessary. If it pays to breed at all it pays to breed well; therefore, a few good mares of the Clydesdale type, with good, flat, clean bone, good hair and feet, a good head, large nostrils, broad deep chest, large body with well-sprung ribs, short back with good action, should be obtained. These should weigh from 15 to 17 cwt., and should be mated with a sire of the same breed of the best class that is to be obtained in the district. The outlay of a few extra pounds for the services of a good sire will always repay the farmer. Particular care should be taken to always make sure that the stallion has a Government certificate. Long experience has taught me that for the improvement of horses you have to look more to the sire's side than to the dam's side, because unless the dam came from an approved breed of stock of a long line of descendants, the chances are that she may fall back to some weedy ancestor. Crossing light mares with heavy sires is not a thing to be approved of for general farm purposes. I am in favour of prohibiting an unsound stallion to stand in a district. I am also in favour of subsidising a good sound Clydesdale sire for this district.

A visit to Wagga Farm will be paid by the members of the Milbrulong Branch on the 30th October.

Nelson's Plains.

The members of the above branch assembled in large numbers to hear Mr. J. R. G. Bryant, Assistant Fruit Expert, deliver a lecture on "Fruit-culture."

New Italy.

A lecture on "Viticulture" was delivered to members of the above branch by Mr. M. Blunno, Viticultural Expert. There was a large attendance present, who listened attentively to the lecturer's remarks on the subject of manuring, long and short pruning, single and double Guyot system, and wine-making. Further particulars of this lecture will appear in next month's *Gazette.*

Orchard Hills.

The members of the above branch visited the Hawkesbury Agricultural College on the 3rd October. Those present speak in very high terms of the manner in which they were looked after by Mr. Potts, the Principal. In fact, so much was the visit enjoyed that it is intended to pay another visit shortly.

Ringwood.

A branch of this Bureau has been formed at Ringwood. The following were elected office-bearers for the ensuing year:—Mr. Thomas Gorman, President; Messrs. F. Keenan and W. Gilmore, Vice-Presidents; Mr. William Tait, Treasurer and Secretary.

Sackville.

The usual meeting of this branch took place on the 20th September. The president, Mr. J. Asprey, J.P., occupied the chair. To a good attendance of members, Mr. A. Manning read a paper on "Melon-culture," which was attentively listened to.

He considered melon-growing a profitable occupation, but one that required greater attention than was generally given it. Melons would grow on fairly poor soil, and he based his remarks on the yields obtained on the sandy loams on the Hawkesbury flats. Mr. Manning advocated the following cultivation methods:—

Run a fire over the couch grass preparatory to ploughing. Plough the land shallow, and let it lie in its rough state for five or six weeks; then roll and plough a second time in the opposite direction to the first ploughing. The drills should be 12 feet apart. A complete manure containing phosphoric acid, nitrogen and potash at the rate of one tablespoonful to every hole, mixing it thoroughly with the soil, was advocated. For early beds, shooting the seed was recommended.

Cultivation.—In connection with melon-growing, this should always be done on a shallow basis; when the plants are just showing up, disturb and move the soil round the plants with fingers or small stick. After ten days chip the soil, and when from four to five leaves are showing, plough the land (irrespective of whether weeds are present or not); when the vines are 2 feet long plough again.

Selection of Seed.—Mark melons of uniform size with slender stem for seed next season; thick stems indicate a thick rind and a hard centre, and should, therefore, be avoided. For early sowing Florida Favourite, for mid-season sowing Long Green, and for late sowing Cuban Queen were advocated.

A hearty vote of thanks was accorded Mr. Manning for his instructive address.

Spring Hill.

Mr. Veterinary Surgeon Sanderson delivered a lecture on "Mortality among Foaling Mares" to members of this branch on 9th October. There was an excellent attendance.

Tallawang.

A meeting of the above branch was held on Saturday, 28th ultimo. A discussion took place as to the best time for cutting wheat for hay. The majority of those present considered that the best time to cut was when the wheat was well out in ear, but before the grain had fully developed.

With regard to oats, it was considered that this crop should not be cut for hay unless the grain had fully formed, as oaten hay if cut on the green side is unpalatable to horses.

The following questions were sent by the honorary secretary to the Department for answer:—

1. Is the weighing of wheat by the chondrometer for the purpose of fixing a standard quality for a district by which the price may be regulated?

2. Or is the test for the purpose of determining the bushel-weight of wheat for a certain district?

3. Which is most advantageous to the farmer, a high or a low standard?

Departmental Note.—A certain standard of bushel-weight of wheat is fixed annually by the Chamber of Commerce in this State, for the purpose of giving some information to the oversea buyers as to the general quality of wheat for a particular season. Samples are taken from every part of the State in proportion to the area under crop. These samples, after having been thoroughly mixed, are then weighed by the chondrometer, and the result is the standard fixed for this particular year by which the buyers are guided in the purchase of wheat for shipping purposes. This standard is known as "F.A.Q." (fair average quality). Any wheat approaching this standard will be paid for at current market rates; for wheat below the standard a reduction is usually made. The F.A.Q. standard varies according to the season. In a good season it may be as high as 63 lb. per bushel, and in a season when much bleached or pinched grain is in evidence it may be as low as 60½ lb. It must be understood that no matter what the F.A.Q. standard may be wheat is always sold at 60 lb. per bushel, either for local consumption or for export. As far as the farmers collectively are concerned, it matters little to them whether the standard is fixed high or low, as it is fixed according to the wheat they have in their collective possession. Individually it may affect some farmers who submit poor samples for sale when the rest of the State is submitting a fair sample by which the F.A.Q. has been judged and fixed.

Wallendbeen.

At a well-attended meeting of the Wallendbeen Branch, Mr. T. G. Palgrave, M.R.C.V.S., gave a lecture on "Colic and Strangles."

The causes of colic, he said, were various, such as watering horses immediately after feeding, bad feed, working too hard, and putting horses on to hard feed too suddenly after a long spell at grass; horses eating sand frequently developed symptoms of colic.

The symptoms are restlessness, pawing with the fore feet, stamping with hind feet, rolling, and general symptons of uneasiness. The animal frequently breaks out in sweat, looks at his flanks, and breathes hurriedly. The membranes of the eyes are often red, the bowels are constipated, the urine is passed with difficulty, and the animal is evidently in great pain. The treatment Mr. Palgrave advocated was to keep the horse moving slowly, and not to allow it to roll.

An enema of warm soapy water with raw linseed oil added should be given, also a drench composed of—

1 oz. chloral hydrate,
1 oz. (for heavy horse) of sweet nitre,
¾ of an ordinary bottleful of linseed oil.

If the pain still appears severe after two hours, a repeat dose of the chloral hydrate and sweet spirits of nitre should be given in a quart of milk. All preparations containing opium should be avoided. Hot rags should be applied to the abdomen.

For home remedies, ½ tumbler of dry gin with 2 oz. powdered ginger; for windy colic, 2 oz. of bicarbonate of soda, were advocated. If worms are present, 1 oz. of turpentine should be given in addition to the chloral hydrate drench.

Dealing with strangles, Mr. Palgrave said that the symptoms were loss of appetite, staring coat, dejected look, high temperature, red eye membranes, discharge from eyes and nose, and abscess between the branches of lower jaw.

The treatment to be followed was—

1 oz. Epsom salts,
1 oz. hyposulphite of soda,
2 drams of powdered nitre,

in the drinking water night and morning. The head should be steamed with hot water and eucalyptus.

A blister, of mustard made into paste with turpentine and hot water, should be applied to the abscess. The abscess should be kept perfectly clean when it breaks, and should not be allowed to close till all the discharge has ceased.

A number of questions were asked and answered, and a hearty vote of thanks accorded the lecturer.

Following the custom which they adopted last year, the members of the Wallendbeen Branch journeyed to Wagga Experiment Farm. A very enjoyable day was spent, and many points of interest were noted by the visitors.

Walla Walla.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a lecture on "Fruit-culture," which was much appreciated by the large audience which was present.

Walli.

"Strangles, Influenza, and Tetanus" was the subject of a lecture delivered by Mr. Veterinary Surgeon Sanderson at Walli.

Wolseley Park.

"Fruit-culture," was the subject upon which Mr. J. G. R. Bryant, Assistant Fruit Expert, addressed the members of the Wolseley Park Branch.

Papers on "Fallowing" were read by Messrs. W. Eisenhauer, A. C. Evans, and Hugh McEachern.

The object of the discussion was to determine the best time to fallow in this district, the best implement—mould-board or disc—for the purpose, and the best average depth.

It was contended that by fallowing in October, weeds such as sorrel, which are very troublesome in this district, could be more easily eradicated.

Mr. T. BAGUST, jun., asked why it was that sorrel could be better killed by October fallowing than by winter fallowing.

Mr. H. MCEACHERN said the reason was that when ploughed in October the plant had reached the flowering stage, to reach which it had expended a great deal of energy, and was, therefore, in a weaker condition to send out fresh growth than it would have been in the winter; again when ploughed in October the days were generally hot enough to dry the land, and also the exposed sorrel roots, and so prevent them striking afresh, whereas in winter ploughing the land would remain moist, and so enable the plant to resume its growth.

Mr. A. J. SHEEHAN asked why winter fallowing should not be as good as spring fallowing?

Mr. H. MCEACHERN said that when ploughed in winter, the later winter and early spring rains caused the land - which in this district is largely of a clayey nature—to run together, and then when the warm weather came it would bake hard and crack on the surface; also more weeds would grow on land ploughed in winter than on that ploughed in spring.

Mr. GARNER said he believed in autumn fallowing, and sowing a crop of a leguminous species, to be ploughed in at a later date, and so retain a good supply of humus and nitrogen in the soil.

Mr. W. MCEACHERN supported October fallowing. A crying need of the soil in this district was humus, and by ploughing land when it carried a good coat of grass, humus was in a measure restored to the soil Also, fewer weeds would be likely to germinate in October, and the necessity of future working of the fallow would be minimised. He thought the less the fallow could be worked the better, for, he said, it has been proved that constant working of the fallow has removed from the soil up to 500 lb. per acre of nitrogen. As nitrogen is a great essential to plant growth, and a costly one to replace by artificial fertilising, it would be to advantage to retain it in the soil as much as possible.

Mr. W. EISENHAUSER supported winter fallowing because it could be done when the horses would be idle, and so help to keep the farm work regulated the whole year round. Also, by fallowing in winter the winter rainfall was conserved, and if kept worked from then on till the following autumn the moisture would be retained throughout, and the land would be in the best of condition for sowing.

On the question being put, the meeting decided upon spring as the best time for fallowing in this district.

The best class of plough for the purpose was now considered, viz., the mould-board or the disc, the meeting deciding in favour of the mould-board, because weeds, &c., were more effectively buried by it, and on the whole it was considered to do better work.

The depth was now considered. Mr. GARNER said he thought the soils in the district were too varied to arrive at an average depth; while some soils were only a few inches, others were several feet in depth.

Mr. W. McEachern said an average depth could not be determined on account of the irregularity of soils, which varied even in the same paddock—deep soils could be ploughed deeper than the shallow ones.

There was an attendance of about forty at the above-mentioned meeting, and the interest shown in the subject was keen.

Departmental Note.—October fallowing is the most advantageous for the district. Soils deficient in humus, which are liable to run together and set hard after rain, must not be worked too much; it is better to leave such land in a rather rough state for sowing than work it too fine.

Wyan.

Mr. Veterinary Surgeon A. E. Massy lectured to members of this branch on the "Treatment of Water Colic, Strangles, and Wounds in Stock." The lecture was much appreciated by those present.

Yass.

Mr. T. G. Palgrave, M.R.C.V.S., delivered a lecture on "Tuberculosis" to members of this branch on the 20th September.

The lecturer said that while tuberculosis was rare amongst savages and wild animals, its fearful ravages were only too common amongst civilized races and domestic animals. Wild animals when kept in captivity also frequently developed the disease. The difficulty experienced was to detect the disease in pigs and cattle till far advanced, because clinical symptoms were not too well marked.

The distribution of the disease in the system, post-mortem appearances of the disease, application of tuberculin tests, and its consequent results, were dealt with at length.

The danger arising from the consumption of tubercular milk without first rendering it sterile were pointed out. Sterilisation can be effected by boiling the milk for 5 minutes.

EEL-WORMS ATTACKING GRAPE-VINES.

A specimen of grape-vine roots, badly attacked by eel-worms, was recently sent to the Department by a farmer who regarded this as a fungus disease. The Bureau of Microbiology state that no certain remedy is known, as the worm can live its complete life in the soil independent of the plant. It is then a difficult matter to free the soil of the worms and their eggs. Some of the methods of control tried with varying success are as follow:—

Saturate the soil with disinfectant, *e.g.*, carbolic acid about 1 in 20, or about 2 oz. of carbolic acid per cubic foot of earth. About three applications should be made at intervals of ten to fourteen days, as the eggs hatch in about ten days. Removing the old soil round the vines and adding fresh soil mixed with lime, sulphate of potash, or naphthaline may be useful.

GRAFTING WAX.

The ingredients are mixed in different proportions by different growers. Two recipes which are known to give good results are as follow:—

(*a*) 2 lb. mutton tallow; 2 lb. beeswax; 4 lb. resin.

(*b*) 2¼ lb. resin; 2 lb. beeswax; 3 or 4 lb. tallow.

If the weather is cold, a little linseed oil is added, so that the wax will work nicely. The ingredients are all placed in a tin vessel over the fire and melted. After they are dissolved, which takes about 7 minutes, pour into a bucket of cold water and work up with the hands.—W. J. Allen.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

DISINFECTING SHEARING-SHED AND YARDS.—" J.T." : To clean the shed, have all woodwork scrubbed with hot water and soda, and then washed over with a 5 per cent. solution of crude carbolic acid, or a 10 per cent. solution of Jeyes' Fluid in water.

To clean the yards, scrape off about 3 to 6 inches of the surface soil, and remove it quite away from the yards ; then lime the yards all over with a dusting of quicklime. The woodwork of the yards should also be sluiced with the disinfectant used for the shed.

When shearing, see that the tar-stick is used for all cuts, and as soon as practicalbe after the sheep are shorn get them out of the yards. The greatest danger lies in the soil of the yards getting into cuts.—VETERINARY OFFICERS.

SNAILS AND FLUKE.—" A.F.W.," referring to article on Fluke in September *Gazette*, suggests that in dry times snails would be non-existent, except in the few remaining wet places, where their destruction should be comparatively easy, by treating such spots with lime and salt. Though these fresh-water snails live in swamps and damp places, they can stand a good deal of bad times, and have many ways of living in the mud, even after it has dried above them ; so that it would be a very difficult matter to do much in the manner suggested. The birds are the great factors in clearing out these small crustaceous creatures, snails, &c. The more waders and birds like the Magpie lark (Peewee), that feed about such localities, the fewer the snails.—W. W. FROGGATT.

EROSION OF RIVER BANKS.—" R.J.S.," referring to reply to "J.C.D.," in September *Gazette*, points out that in Lincolnshire, England, banks are protected by planting willow cuttings deep into the banks, other longer slips being afterwards laced horizontally between them, basket fashion, and well covered with earth, when they form an impenetrable mass.

The employment of willows and other trees was suggested in pamphlets forwarded to " J.C.D.," but unfortunately this was not mentioned in the *Gazette* note.

MOULD-BOARD V. DISC PLOUGH.—" E.D.M." (Junee) : Much depends upon the class of soil upon which the plough is to be used, the condition of the soil and the time at which the ploughing is to take place. On the lighter soils in the Junee district, I doubt if anyone could find much difference in the results obtained from these two ploughs. The Manager of the Wagga Experiment Farm, on similar soils, strongly favours the disc as against the mould-board.—GEO. VALDER.

DISEASE IN PIGS.—" R.G." : The Chief Inspector of Stock says there is no doubt that the symptoms as described by you point to a lung affection, but as to its exact nature it would be difficult to say without an examination of the carcase of an animal thus affected. It may be that, if they are milk-fed pigs, they are suffering from tuberculosis of the lungs, or it may be ordinary pneumonia accompanying some other affection. However, the best course will be to communicate with the local Stock Inspector.

CROPS FOR GREEN MANURING.—" C.R." : The lupin used for green manuring in Europe is the large common blue variety. We imported some seeds of this from Europe, but have not found it as suitable for green manuring purposes as field peas. Cowpeas have proved the best summer crop for green manuring, and field peas the best winter crop. Lupins are also a winter crop, but as already stated, do not compare favourably with field peas in this State.—GEORGE VALDER.

SOFT-SHELLED EGGS.—" G W." : The white and yolk become covered with shell—which is the lime secretion from the glands at the lower end of the oviduct. When fowls get as much food as they can eat, the oviduct becomes covered with fat, and the secretive functions are interfered with, soft eggs being the result.

Your feeding formula is correct as regards variety, but the midday meal of oats is totally wrong, and should be discontinued. The vegetables, instead of being cooked and fed in the morning, should be given to the poultry green at midday. The maize at night might be changed to wheat. There should also be an all-round reduction in the quantity of food given, and once a week a packet of salts mixed in the morning mash might be given to, say, every dozen fowls.—GEORGE BRADSHAW.

FOWL MANURE.—"T.C.": Yes, fowl manure would do to manure cereal crops, but the difficulty is to distribute it evenly; it should, therefore, be well mixed with dry earth or sand before being distributed.—GEORGE VALDER.

"HELANTI."—"N.J." and "W.B.": We have no tubers of this plant for distribution. You are advised to communicate with Mr. B. Harrison, Cudgera Park, Burringbar, Tweed River. It should be cultivated in the same way as the Jerusalem artichoke. Trials at the Hawkesbury Agricultural College so far indicate that the value of the plant has been somewhat over-rated.—GEORGE VALDER.

DISEASED VIOLET PLANTS.—"Gunnedah": The Bureau of Microbiology finds the roots of the violet plants attacked by eel worms (*Heterodera*), which bore into the roots, often causing galls and completely preventing the action of the roots, and, as a result, the plant dies. They attack very many cultivated plants—vegetables, flowers, fruit-trees, &c. The reappearance of the trouble this year as previously is probably owing to the worms being encysted in the soil during the winter, developing in the spring, and then commencing their attack upon the plants. Ferns are sometimes attacked by a very similar worm in the leaves, or by the same one in the roots. Strawberries are attacked by it. The remedy is very uncertain, viz., various methods of treatment of the soil; but many worms must escape, as they are protected in the roots of the plants, unless all the plants are destroyed. The following have been experimented with:—Saturating the soil with carbolic, 1 in 20, or formalin, 1 in 200; or, mixing with the soil, lime or naphthaline, or sulphate of potash. Applications should be made two or three times with eight or ten days between.

TOMATOES AND POTATOES ON SAME VINE.—"W.I.": Mr. McAlpine, Vegetable Pathologist of the Victorian Department of Agriculture, successfully grafted tomatoes on to potato plants; but, so far, the quality of the marketable portion of the plant referred to by you has been such as to prevent the new plant from being of any commercial value. The tomato and the potato belong to the same order of plants.—A. J. PINN.

CEMENT-BLOCK HOUSE.—"J.A." (Wyalong): For walls that are exposed to the weather, 4 parts sand to 1 part cement, others 6 to 1, may be used. The sand must be fairly coarse and clean for the above quantities, and particular care is required in curing the blocks, that they are not exposed to drying winds, and that they are kept wetted twice a day for at least one week after they are made.—A. BROOKS.

PEARS FOR BATLOW DISTRICT.—"H.S.": As Winter Cole and L'Inconnue do so well in the district, I think it would be advisable to plant largely of these two varieties. P. Barry is usually a heavy cropper, and has proved an excellent variety for oversea export. I think it worthy of a trial. Winter Cole blooms a month earlier than Packham's Triumph, but both ripen practically at the same time.—W. J. ALLEN.

FRUIT-TREES BARKED BY RABBITS.—"W.M.": To help the trees to renew the bark, first paint the places where the rabbits have been eating with thin white lead. Then some nice mellow clay should be secured and worked up with horse and cow manure into a poultice, placed around the trunk of the tree, and covered with bagging.—W. J. ALLEN.

ESTIMATING CHEESE RESULTS.

A SIMPLE method of estimating approximately the amount of cheese which may be made from a given quantity of milk, is to ascertain the fat test of the milk, multiply it by the number of pounds of milk and divide by 100, thereby obtaining the number of pounds of butter-fat available for cheese-making. Multiply the result by 2·6, and the quantity of cheese manufactured will be shown.

Example: 307 lb. milk; 3·8 fat test.

$$307 \times 3{\cdot}8 \div 100 \times 2{\cdot}6 = 30{\cdot}3 \text{ lb. cheese.}$$

—M. A. O'CALLAGHAN.

Orchard Notes.

W. J. ALLEN.

NOVEMBER.

Cultivation.

THE most important work for this time of the year is cultivation. If neglected at this particular season there is very little hope of harvesting crops of fruit which will be payable. Cultivation is the one work which cannot be neglected, and without which no grower can hope to succeed. I would, therefore, urge on all our growers the necessity of keeping their land well worked up to a good depth, and under no consideration leave the ploughing too late in the spring, as during most seasons we require all the moisture which we can possibly conserve, in order to keep the tree in a healthy and growing condition, so that in its turn it may be able to supply the fruit with the required nourishment to bring it to maturity; therefore, work the land well in the early spring, and from that time see that it is kept loose by constant cultivation.

Summer Pruning.

Summer pruning may be started this month, and it is well to go over and regulate the growth of all young trees, thinning and shortening back where required—that is, where the tree is growing too thick—and pruning or pinching back so as to keep the tree evenly balanced and symmetrical. This early summer pruning is more for young trees—to aid in directing the growth to that part of the tree where it is most required.

Codlin Moth.

The orchard should be kept free of any rubbish which will harbour the codlin moth, and the bandages placed around the stem of the tree to catch the grubs of the same should be removed every seven to eight days, and all grubs killed. It is most important that all fallen fruit should be picked up and destroyed regularly. Continue spraying with arsenate of lead for codlin moth.

Harvesting.

The harvesting of the orange and lemon crop will be about completed this month. Early apricots, peaches, and cherries will commence. See that all are well graded, and put up in the most attractive manner. Neither apricots nor peaches should be allowed to become over-ripe before being marketed. As a matter of fact, they should be picked on the green side, as it is usually a few days after they leave the orchard before they reach the consumer, by which time they are in about right condition for use.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	....	....	Berry	*
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
" ...	Imperialist ...	Florio	Lady Nancy of Minembah.	" "	*
" ...	March Pansy ...	Earl March ...	Australian Pansy	Grafton Farm ...	*
					*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
" ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	" "	*
" ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
" ...	Jamaica Jack ...	Sir Jack ...	Rum Omelette (imp.).	Wollongbar Farm	*
" ...	Royal Blood ...	Berry Melbourne	Calceolus ...	" "	*
" ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ..	Berry Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Cowra Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Swan Bay... ...	22 June, '13.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Kyogle	1 Feb., '13.
" ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Maclean	15 Jan., '13.
" ...	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Grafton	3 April, '13.
" ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	H.A. College, Richmond	*
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
" ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton Farm ...	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
" ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	Tweed River ...	12 Feb., '13.
" ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
" ...	Good-bye ..	Western Duke...	Souvenir (imp.)	Casino	1 May, '13.
" ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones' Island ...	1 June, '13.
" ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Pambula	23 April, '13.
" ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Lismore	3 Jan., '13.
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 May, '13
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm.	*
" ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
" ...	Orphan Boy ...	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
" ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	" "	*
"	Bratha's Boy ...	Aicme Chin (imp.)	Bratha 4th ...	" "	*
"	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

Department of Agriculture,
Sydney, 2nd November, 1912.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORNS.—Royal Success: sire, Royal Hampton 10th (imp.); dam, Waratah; calved 10th October, 1910; colour, red. Price, **£30.**

Waratah is by Dora's Boy from Australian Pansy. Australian Pansy was by Airy Knight 2nd from Pansy 4th (imp.) Dora's Boy was by Cornish Boy (imp.), from Lady Dora (imp.)

Waratah yielded 5,305 lb. of milk last season, testing 3·6 per cent., or equal to 223 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter fat. Lady Dora (dam of Dora's Boy) gave 9,560 lb. of milk in 265 days.

This bull combines the successful Dora's Boy and Pansy blood.

Duke of Hampton: sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

GUERNSEYS.—King John: sire, King of the Roses (imp.); dam, Saucy Rose; calved 29th August, 1911; colour, lemon and white. Price, **£50.**

Saucy Rose is by Calm Prince from Rose Petal; she yielded 5,298 lb. milk with an average test of 5 per cent. butter-fat, or a butter production of 311 lb.

Belfast: sire, King of Roses (imp.); dam, Flaxy 2nd; calved 20th September, 1911; colour, lemon and white. Price, **£40.**

Flaxy 2nd is by Rose Prince (imp.) from Flaxy (imp.). Flaxy (imp.) in thirty-seven weeks gave 6,443 lb. of milk, which it is estimated produced 334 lb. of butter. Flaxy 2nd developed a habit of sucking herself, and the only record shows 3,333 lb. of milk, testing 5 per cent.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Beaucaire's Baby: sire, Monsieur Beaucaire; dam, Rosey of Wollongbar; calved 28th March, 1911. Price, **£40.**

Confidence: sire, Royal Preel, by Itchen Preel from Hayes' Lily du Preel (imp.); dam, Faith, by Prince Souvia from Clatford Hopeful (imp.); calved 30th April, 1911. Price, **£45.**

Captain Rose: sire, Monsieur Beaucaire; dam, Parson's Red Rose 2nd (imp.); calved, 25th December, 1911. Price, **£35.**

Monsieur Beaucaire is by Calm Prince from Flaxy (imp.) Calm Prince was by Rose Prince (imp.) from Gentle (imp.). Parson's Red Rose yielded 4,860 lb. of milk in a lactation period, equal to 268 lb. of butter.

BULLS FOR SALE—*continued.*

AT WOLLONGBAR EXPERIMENT FARM—*continued.*

GUERNSEYS.—* Knight of The Garter : sire, Monsieur Beaucaire ; dam, Jasmine 2nd (imp.) ; calved 10th December, 1911. Price, **£30.**

Jasmine 2nd (imp.) gave 4,789 lb. of milk in a period, equal to 269 lb. of butter.

*** St. Michael of Wollongbar :** sire, Trequean Mike (2103) ; dam, Polly 2nd of Roque Balan (imp.) ; calved 21st August, 1911. Price, **£40.**

Polly 2nd of Roque Balan (imp.) yielded 4,157 lb. of milk, equal to 235 lb. of butter.

AYRSHIRES.—*Cousin Jock : sire, Jamie's Heir, dam, Auchen Rose ; calved 16th November 1911. Price, **£15.**

Jamie's Heir is by Jamie of Oakbank from Miss Prim. Miss Prim is by Mischiefmaker (imp.) from Primrose of Barcheskie (imp.). Last year, when 12 years old, she yielded 5,834 lb. of milk, equal to 240 lb. of butter

Auchen Rose is by Daniel (imp.) from Primrose of Barcheskie (imp.) She yielded 4,841 lb. of milk in a period, equal to 228 lb. of butter, on second calf in a dry season last year.

*** Old Jock :** sire, Jamie's Heir ; dam, Auchen Dandy ; calved 22nd November, 1911. Price, **£15.**

Auchen Dandy is by Daniel (imp.) from Dandy of Rattenraw (imp.). She yielded 4,273 lb. of milk on her second calf, equal to 216·5 lb. of butter.

H. C. L. ANDERSON, Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

Society.	Secretary.	Date.
1912.		
Lismore A. and I. Society	T. M. Hewitt	Nov. 6, 7, 8
Tweed River A. Society	A. E. Budd	„ 13, 14
Mullumbimby A. Society	W. O. Davis	„ 27, 28
1913.		
Albion Park A., H., and I. Association	M. A. Brown	Jan. 15, 16
Gosford and Brisbane Water A. and H. Association	R. J. Baker	„ 24, 25
Kiama A. Association	G. A. Somerville	„ 24, 25, 27
Wollongong A., H., and I. Association	M. A. O'Donnell	„ 30, 31, Feb. 1.

* Applications for these bulls will be held till 21st November, 1912. If more than one application be received for any one bull, his disposal will be decided by ballot.

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1913.

Society.	Secretary.	Date.
Berry A. Association	C. W. Osborne	Feb. 5, 6
Alstonville A. Society	W. M. Monaghan	,, 11, 12
Tamworth P. and A. Association	J. R. Wood	,, 11, 12, 13
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 12, 13
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 13, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	,, 18, 19, 20
Cobargo A., P., and H. Society	T. Kennelly	,, 19, 20
Wyong A. Association	J. H. Kay	,, 20, 21, 22
Central Cumberland A. and H. Association	H. A. Best	,, 21, 22
Dapto A. and H. Society	J. H. Lindsay	,, 25, 26
Bangalow A. and I. Society	W. H. Reading	,, 25, 26, 27
Armidale and New England P., A., and H. Assoctn.	A. McArthur	,, 25–28
Campbelltown A. Society	F. Sheather	,, 26, 27
Gulgong A. and P. Association	D. H. Spring	,, 26, 27
Gunning P., A., and I. Society	J. R. Turner	,, 26, 27
Manning River A. and H. Association (Taree)	S. Whitbread	,, 26, 27
Tumut A. and P. Association	T. E. Wilkinson	,, 26, 27
Armidale and New England P., A., and H. Assoctn.	A. McArthur	,, 26–28
Inverell P. and A. Association	J. McIlveen	,, 26, 27, 28
Northern A. Association (Singleton)	E. J. Dann	,, 27, 28, Mar. 1.
Nepean District A., H., and I. Society (Penrith)	P. J. Smith	,, 28, Mar. 1.
Southern New England P. and A. Association, Uralla.	W. McCrossin	Mar. 4, 5
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 4, 5, 6
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 4, 5, 6
Bega A., P., and H. Society	W. A. Zingel	,, 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Camden A., H., and I. Society	A. Thompson	,, 5, 6, 7
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 5, 6, 7
Newcastle A., H., and I. Association	C. W. Donnelly	,, 5, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 6, 7
Port Macquarie and Hastings District A. and H. Society	T. Dick	,, 6, 7
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge	,, 11, 12, 13
Bombala A. Society	W. G. Tweedie	,, 12, 13
Molong P. and A. Association	W. J. Windred	,, 12
Macleay A., H., and I. Association	E. Weeks	,, 12, 13, 14
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 12, 13, 14
Goulburn A., P., and H. Society	G. G. Harris	,, 13, 14, 15
Gundagai A. Society	A. Elworthy	,, 18, 19
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 26, 27
Cooma P. and A. Association	C. J. Walmsley	April 2, 3
Bathurst A., H., and P. Association	J. Bain	,, 2, 3, 4
Hunter River A. and H. Association	E. H. Fountain	,, 2–5
Wauchope P., A., and H. Society	A. D. Suters	,, 3, 4
Cobar P. and A. Association	D. H. Dunlop	,, 5, 6
Clarence P. and A. Society (Grafton)	G. N. Small	,, 9, 10, 11
Orange A. and P. Society	W. Tanner	,, 9, 10, 11
Dorrigo A., H., and I. Society	W. R. Colwell	,, 10, 11
Moree P. and A. Society	D. E. Kirkby	,, 15, 16, 17
Dungog A. and H. Association	C. E. Grant	,, 16, 17
Merriwa A. and P. Association	V. Budden	,, 16, 17
Upper Manning A. and H. Association (Wingham)	D. Stewart, junr	,, 23, 24
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	Aug. 19, 20, 21
Germanton P., A., and H. Society	J. S. Stewart	Sept. 3, 4
Young P. and A. Association	T. H. Tester	,, 9, 10, 11
Cowra P., A., and H. Association	G. S. Fisher	,, 16, 17.

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Agricultural Gazette of New South Wales.

Field Experiments with Wheat, 1911.

DETAILS of these experiments up to the end of the season 1910 were published in the *Gazette* last year. The present series of reports embraces the season 1911.

The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for a few years or less. Later, when results for, say, five years are obtained, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile, it is felt that the public are entitled to know the results obtained each year.

IV.—A MANURIAL TRIAL.

[For 1910 results see *Gazette* for November, 1911.]

Object.—To determine the effect upon the yield of wheat of the application of simple and mixed fertilisers when applied at the same time that the wheat is planted, *i.e.*, directly with the wheat crop, and to soil in which the fertility and the supply of organic matter are maintained by a suitable rotation. Incidentally, the results will show the character of the fertiliser required for the best results, and also the advisability or otherwise of applying the fertiliser to the rotative crop instead of to the wheat crop.

The following fertilisers, singly and in combination, are compared with each other, and also with the results obtained from land that receives no manure when the wheat crop is planted.—Dried blood, sulphate of potash, and superphosphate. A mixture of dried blood, superphosphate, and sulphate of potash is also compared with a mixture of sulphate of ammonia, superphosphate, and sulphate of potash, to determine whether the organic form of nitrogen supplied in the dried blood is equal to or better than the nitrogen supplied in the sulphate of ammonia.

The quantity of nitrogen, phosphoric acid, and potash added to the plots receiving such is the same in each case.

In order to even up the plots so that the effect of a fertiliser applied directly to the wheat crop may be observed, complementary manures are applied to the renovating crop, in such a way that each plot will receive a dressing of the same kind and quantity of complete fertiliser during the course of the rotation.

The yields from eight plots manured at the time the wheat is planted with simple and mixed fertilisers are compared with the yields obtained from five check plots which receive no manure when the wheat is planted.

The differences due to the various fertilisers applied to the plots are not estimated by comparing the yields of the plots one with another, but by comparing the differences which exist between the actual yields of the plots and the yields which it is estimated these plots would have produced had they been planted as check plots. This estimated yield is based upon the assumption that the differences between neighbouring check plots are due to regular and similar variations in the soil between them. The natural yield of any plot will, therefore, be intermediate between those of its two check plots, and proportionate to its distance from them.

The plots are arranged so that the first, and then every succeeding third plot, is a check plot.

Except in regard to the amount and character of the fertilisers applied to the different plots, the whole block is treated uniformly. The plots are prepared and planted as nearly simultaneously as the weather will permit.

COWRA EXPERIMENT FARM.

F. DITZELL, Experimentalist.

This experiment has been carried out in accordance with the general directions given above.

The rotation adopted is a two-course one, the rotative crop grown at this farm being field-peas. On account of the rotation, two blocks are required; those reserved being two portions of H VI.

Previous History of the Block.

The dates of clearing and breaking up, and subsequent cropping of block H, were given in the last August *Gazette* under Experiment III.

Preparation of the Ground.

The preceding crop of Canada field-peas was harvested for grain (pulse) in December, 1910. The land was disc-ploughed about 5 inches deep on the 4th March, 1911, and was harrowed on the 30th idem. It was again disc-ploughed about 5 inches deep on the 6th April, and was harrowed immediately afterwards. It was finally disc-cultivated on the 17th June.

Planting.

The different plots were arranged as per sketch A, and were planted on the 27th June. The plots were 16 links wide to accommodate the width of the drill.

Bunyip wheat was sown—the rate of seeding being about 49 lb. per acre. The seed was treated with bluestone (2 per cent) and lime-water, to prevent bunt.

The ground was in good condition as regards tilth, moisture, &c., at time of planting.

The quantities of fertilizers applied per acre to the various plots are shown on sketch A. These were calculated from the analyses of the various fertilisers, so that each quantity of fertiliser would supply the amount of phosphoric acid (15 lb.), potash (15·6 lb.), and nitrogen (12·42 lb.) which it had been arranged to supply per acre. Each fertiliser or mixture of fertilisers was previously mixed up with sand to a certain bulk, so that the drill was set to sow at the same rate for each mixture, viz., 160 lb. of sand and fertiliser per acre.

As previously mentioned, the plots were 16 links wide, which is 3·2 links greater than the space occupied by the plants in the plot. The plants in the portion of any plot harvested for comparison are, therefore, sufficiently far from the plants of the adjacent plots receiving different treatment to give reliable results, *i.e.*, the results are not rendered unreliable by diffusion of manures.

Rainfall.

The rainfall recorded during the year, together with some remarks upon the season, were given in the last June *Gazette*, page 474.

Observations during Growth.

The germination was good. On the 22nd September it was noted that, although all the plots had made a good growth, Nos. 4, 7, 10 ,12 and 13 had made the best growth. These were the plots to which superphosphate had been applied, either alone or in combination with other fertilisers.

The plots commenced to head out on the 28th September, and to ripen on the 8th November, those plots to which superphosphate had been applied, either singly or in combination, namely, Nos. 4, 7, 10, 12 and 13, being slightly earlier than the remainder.

The wet and fairly rough weather experienced at the end of November and the beginning of December did not affect this wheat much, other than by bleaching the grain. The growth was rather too short to be "laid."

Harvesting.

Before harvesting, the plots were reduced to one-ninth of an acre in area, by cutting off the ends. The several plots were harvested for grain with a stripper, and were winnowed on the 12th December, and from the weights thus recorded, which are those of a farmer's sample, the yields per acre have been computed.

Results.

Table I shows the results obtained from the two years for which this experiment has been in progress, and also the average of the same.

The results, arranged in order of merit for each year, and also the average for both years, are as follow :—

1910.	1911.	Average for 1910 and 1911.
Superphosphate	Superphosphate	Superphosphate.
Dried blood	Dried blood, superphosphate and sulphate of potash.	Dried blood, superphosphate and sulphate of potash.
Sulphate of potash	Superphosphate and sulphate of potash.	Sulphate of potash.
Dried blood and superphosphate.	Sulphate of potash	Superphosphate and sulphate of potash.
Sulphate of ammonia, superphosphate and sulphate of potash.	Unmanured	Unmanured.
Superphosphate and sulphate of potash.	Dried blood and sulphate of potash.	Dried blood and superphosphate.
Dried blood, superphosphate and sulphate of potash.	Dried blood and superphosphate.	Sulphate of ammonia, superphosphate and sulphate of potash.
Unmanured	Sulphate of ammonia, superphosphate and sulphate of potash.	Dried blood.
Dried blood and sulphate of potash.	Dried blood	Dried blood and sulphate of potash.

These fertilisers are arranged in order of merit in accordance with their "percentage" yield.

As these results have been obtained in each year from ground in which the experiment has been planted for the first time, since the experiment is run on a two-course rotation, no definite conclusions can be drawn from them, but it is interesting to note that in each year superphosphate alone has topped the list.

The average yield of Bunyip from all the plots in this experiment was 13·2 bushels. The previous year it was 35·51 bushels. The average yield of the check plots was 34·93 bushels in 1910 and 13·02 bushels in 1911. This illustrates clearly the difference between the two wheat seasons of 1910 and 1911.

Sketch A shows the fertilisers applied to the wheat crop, and Sketch B, the fertilisers applied to the renovating crop.

EXPERIMENT IV.

MANURIAL Trial with Wheat, Cowra Experiment Farm, 1911.

Sketch A.

Showing fertilisers applied to the wheat crop.

		lb.	
15.	DIVISION.		
14.	Unmanured		(*Check plot.*)
13.	Sulphate of ammonia Superphosphate Sulphate of potash	61 87 30	
12.	Dried blood Superphosphate Sulphate of potash	106 87 30	
11.	Unmanured		(*Check plot.*)
10.	Superphosphate Sulphate of potash	87 30	
9.	Dried blood Sulphate of potash	106 30	
8.	Unmanured		(*Check plot.*)
7.	Dried blood Superphosphate	106 87	
6.	Sulphate of potash	30	
5.	Unmanured		(*Check plot.*)
4.	Superphosphate	87	
3.	Dried blood	106	
2.	Unmanured		(*Check plot.*)
1.	DIVISION.		

Sketch B.

Showing fertilisers to be applied to renovating crop.

		lb.
15.	DIVISION.	
14.	Dried blood Superphosphate Sulphate of potash	106 87 30
13.	Nil.	
12.	Nil.	
11.	Dried blood Superphosphate Sulphate of potash	106 87 30
10.	Dried blood	106
9.	Superphosphate	87
8.	Dried blood Superphosphate Sulphate of potash	106 87 30
7.	Sulphate of potash	30
6.	Dried blood Superphosphate	106 87
5.	Dried blood Superphosphate Sulphate of potash	106 87 30
4.	Dried blood Sulphate of potash	106 30
3.	Superphosphate Sulphate of potash	87 30
2.	Dried blood Superphosphate Sulphate of potash	106 87 30
1.	DIVISION.	

Each plot is 16 links wide and 800 links long, and has, therefore, an area of ·128 acres. The total area occupied by the experiment is ·128 acres × 15 (Plots) = 1·92 acres.

Table I.—Results obtained from the use of various fertilisers, Experiment IV, Cowra Experiment Farm, 1910 and 1911.

Plot No.	Fertiliser used on Plot.	1910.			1911.			Average for 1910–1911.	
		Computed Yield per Acre	Natural Yield per Acre.	Percentage Yield.	Computed Yield per Acre.	Natural Yield per Acre.	Percentage Yield.	Computed Yield per Acre.	Percentage Yield.
		bushels.	bushels.		bushels.	bushels.		bushels.	
2	Unmanured ... ... (*Check*)	36·16	33·16	100·00	12·75	12·75	100·0	22·95	100·00
3	Dried blood ...	36·16	34·22	105·66	12·30	13·10	93·9	24·23	99·78
4	Superphosphate	37·50	35·27	106·32	14·40	13·45	107·1	25·95	106·71
5	Unmanured ... ... (*Check*)	36·33	36·33	100·00	13·80	13·80	100·0	25·06	100·00
6	Sulphate of potash	37·50	36·16	103·70	14·10	14·00	100·7	25·80	102·20
7	Dried blood and superphosphate ...	37·33	36·00	103·69	13·65	14·20	96·1	25·49	99·89
8	Unmanured ... ... (*Check*)	35·83	35·83	100·00	14·40	14·40	100·0	25·11	100·00
9	Dried blood and sulphate of potash	32·00	35·33	90·57	13·80	14·00	98·6	22·90	94·58
10	Superphosphate and sulphate of potash ...	35·50	34·83	101·92	13·80	13·60	101·5	24·65	101·71
11	Unmanured ... ... (*Check*)	34·33	34·33	100·00	13·20	13·20	100·0	23·76	100·00
12	Dried blood, superphosphate and sulphate of potash	35·00	34·55	101·30	13·20	12·45	106·0	24·10	103·65
13	Sulphate of ammonia, superphosphate and sulphate of potash	36·00	34·78	103·50	11·25	11·70	96·1	23·62	99·80
14	Unmanured ... ... (*Check*)	35·00	35·00	100·00	10·95	10·95	100·0	22·97	100·00

WAGGA EXPERIMENT FARM.

R. W. McDIARMID, Experimentalist.

THE object of this experiment, the plan of the experiment, and the general arrangements for carrying it out, are explained above. The experiment has been conducted on the same lines as adopted last year. The variety used this year was Federation.

Preparation of the Ground.

The previous crops and the cultivation of the ground for this experiment were identical with those described under Experiment No. III (*Gazette*, August, 1912, page 650).

Planting.

The arrangement of the plots and the fertilisers applied are the same as those of the previous year. The variety sown was Federation, at the rate of 30 lb. per acre. The seed was dipped in a formalin solution of 1 lb. to 48 gallons of water, for five minutes, the day prior to planting.

The condition of the seed-bed at planting time was good, but there was not sufficient moisture present to germinate the seed. Rain fell shortly after planting, and produced a good germination.

The cultivation given during the growth of the crop consisted of one harrowing on 10th August.

Harvesting.

The plots were halved, one half being cut for hay and one half for grain. The plots were previously reduced to one-fourth acre by taking a piece off from each end of each. The cutting for hay was done just when the crop was well in flower; some plots were cut by hand and some with the binder.

The Results.

The results are given in the tables which follow.

Hay Section.—Deductions should not be drawn from these results, for they are those of one season only. They show the value of superphosphate as a fertiliser for hay. Applications of sulphate of ammonia, sulphate of potash, and the two combined, apparently have no beneficial effect on the crop, but the results may be different after a number of rotations have been conducted.

Grain Section.—On examining the table of results, it is evident the superphosphate contains the essential ingredient required. The results are very similar to those obtained last season. The application of the mixture of superphosphate and sulphate of potash gave the highest yield per acre. The addition of sulphate of ammonia to the superphosphate seems to detract from the value of the superphosphate alone, while the yield of the plot that received sulphate of ammonia is less than that of the unmanured plots.

HAY RESULTS.

Area of plots harvested, $\frac{1}{8}$ acre. Variety, Federation.
Date sown, 15th May, 1911.

Plot.	Manure per acre.		Yield per plot.			Yield per acre.				Natural Yield.				Percentage Yield.
		lb.	cwt.	qr.	lb.	t.	cwt.	qr.	lb.	t.	cwt.	qr.	lb.	
1 (*Check*)	No manure	...	2	1	14	0	19	0	0	0	19	0	0	100
2	Sulphate of ammonia	61	2	2	14	1	1	0	0	1	2	1	9	94·04
3	Superphosphate	88	4	2	10	1	16	2	24	1	5	2	19	143·02
4 (*Check*)	No manure	..	3	2	14	1	9	0	0	1	9	0	0	100
5	Sulphate of potash	30	4	0	14	1	13	0	0	1	10	3	1	107·28
6	Sulphate of ammonia Superphosphate	61 88	5	0	2	2	0	0	16	1	12	2	3	123·41
7 (*Check*)	No manure	...	4	1	4	1	14	1	4	1	14	1	4	100
8	Sulphate of ammonia Sulphate of potash	61 30	4	0	2	1	12	0	16	1	13	1	20	96·15
9	Sulphate of potash Superphosphate	30 88	5	2	22	2	5	2	8	1	12	2	8	140
10 (*Check*)	No manure	...	3	3	24	1	11	2	24	1	11	2	24	100
11	Sulphate of ammonia Sulphate of potash Superphosphate	61 30 88	4	2	12	1	16	3	12	1	10	1	12	121·41
12	Dried blood Sulphate of potash Superphosphate	105 30 88	5	1	20	2	3	1	20	1	9	0	0	149·75
13 (*Check*)	No manure	..	3	1	23	1	7	2	16	1	7	2	16	100

Average yield of check plots = 1 ton 8 cwt. 1 qr. 9 lb. per acre.

GRAIN RESULTS.

Area of plots harvested, $\frac{1}{8}$ acre. Variety, Federation.
Date sown, 15th May, 1911.

Plot.	Manure per Acre.		Yield per Plot.	Yield per Acre.	Natural Yield.	Percentage Yield.
		lb.	lb.	bus.	bus.	
1 (*Check*)	No manure	...	79	10·53	10·53	100
2	Sulphate of ammonia	61	81	10·8	13·56	79·64
3	Superphosphate	88	166	22·13	16·58	133·48
4 (*Check*)	No manure	...	147	19·6	19·6	100
5	Sulphate of potash	30	145	19·33	19·6	98·62
6	Sulphate of ammonia Superphosphate	61 88	196	26·13	19·6	133·31
7 (*Check*)	No manure	...	147	19·6	19·6	100
8	Sulphate of ammonia Sulphate of potash	61 30	145	19·33	18·84	102·6
9	Sulphate of potash Superphosphate	30 88	197	26·26	18·09	145·16
10 (*Check*)	No manure	..	130	17·33	17·33	100
11	Sulphate of ammonia Sulphate of potash Superphospate	61 30 88	187	24·93	18·04	138·19
12	Dried blood Sulphate of potash Superphosphate	105 30 88	195	26·	18·75	138·67
13 (*Check*)	No manure	..	146	19·46	19·46	100

Average yield of check plots = 17·30 bushels per acre.

BATHURST EXPERIMENT FARM.

J. W. SHAW, Experimentalist.

THE object and the general directions governing this experiment have been explained previously.

Rotation.

The rotation adopted is a two-course one, in which wheat alternates with a fodder crop. Rape was sown on the 1st April, 1910, and superphosphate, at the rate of 56 lb. per acre, was applied with the seed. As a means of evening up the plots, complementary manures should have been applied before the rape was sown, but instructions were received after all the fodder crops had been planted.

The plots were fed-off with sheep as a whole during the winter months, and the land ploughed to a depth of 6 inches at the end of October. It lay in this condition until January, when it was skim-ploughed 4 inches deep to destroy weeds and maintain the mulch. Just prior to planting the land was again skim-ploughed 4 inches deep.

Manures.

The manures used in 1911 were mixed and run through the seed-drill by Mr. Ditzell, Experimentalist at Cowra Farm, in 1910. To overcome the possibility of their not sowing correctly in the field, they were run through the drill prior to planting in 1911.

Planting.

As a preventive against Bunt (Stinking Smut), the usual practice of treating the seed with bluestone (1 in 60) and lime-water was resorted to.

The plots were planted on the 22nd April, 1911, Cleveland wheat being used.

Young Growth.

The effect of the manuring on the young growth was most marked on plots Nos. 5, 6, 9, and 12; particularly so on plot No. 5.

Harvesting.

Prior to harvesting, the headlands were cut off at both ends, and the plots reduced to ⅛ of an acre in area; they were cut with the reaper and binder on the 11th December.

Rainfall.

The rainfall for the year is given in the June number of the *Gazette*, page 485.

Summary of Results.

As will be seen from the tables, the highest yield was obtained from the plot which received the dressing of complete manure. It is doubtful if the increased yield in any plot can be attributed to the fertiliser applied, as the season last year was one in which manuring did not appear to benefit the yields. This was the case right throughout the Farm.

It will only be when the experiment has been in progress for a number of years that final conclusions may be drawn.

PLAN OF EXPERIMENT No. IV (Fertiliser Trial), showing arrangements of plots and quantity of fertiliser applied per acre. Bathurst Experiment Farm, 1911.

		BUFFER.
1.	(*Check.*)	Unmanured.
2.		Blood, 106 lb.
3.		Superphosphate, 87 lb.
4.	(*Check.*)	Unmanured.
5.		Sulphate of potash, 30 lb
6.		Blood, 106 lb.; superphosphate, 87 lb.
7.	(*Check.*)	Unmanured.
8.		Blood, 106 lb.; sulphate of potash, 30 lb.
9.		Superphosphate, 87 lb.; sulphate of potash, 30 lb.
10.	(*Check.*)	Unmanured.
11.		Blood, 106 lb.; superphosphate, 87 lb.; sulphate of potash, 30 lb.
12.		Sulphate of ammonia, 61 lb.; superphosphate, 87 lb.; sulphate of potash, 30 lb.
13.	(*Check.*)	Unmanured.
		BUFFER.

Table showing the results obtained from the use of the different fertilisers.

Variety of wheat: Cleveland.
Date planted: 22nd April, 1911.
Date harvested: 11th December, 1911
Area harvested: ⅛ acre.

Plot No.	Manure per Acre.		Plot Yield.	Acre Yield.	Natural Yield.	Percentage Yield.
		lb.	lb	bus.	bus.	
1 (*Check*)	Unmanured	...	226	30·13	30·13	100
2 ...	Blood	106	239	31·86	31·86	100
3 ...	Superphosphate ..	87	.. ..	.. ...	31·2	...
4 (*Check*)	Unmanured	..	226	30·13	30·13	100
5 ...	Sulphate of potash .	30	. .	......	30·17	...
6 ...	Blood ... . Superphosphate	106 87	236	31·46	30·21	104·13
7 (*Check*)	Unmanured		227	30·26	30·26	100
8 ...	Blood ... ... Sulphate of potash ..	106 30	227	30·26	30·66	98·69
9 ...	Superphosphate Sulphate of potash .	87 30	244	32·53	31·06	104·73
10 (*Check*)	Unmanured . .		236	31·46	31·46	100
11 ..	Blood ... .. Superphosphate . . Sulphate of potash	106 87 30	255	34·0	31·20	108·97
12 ...	Sulphate of ammonia . Sulphate of potash .. Superphosphate ...	61 30 87	237	31·6	30·94	102·13
13 (*Check*)	Unmanured ...	.	230	30·66	30·66	100

Note.—As very probably a mistake was made by reversing the manures intended for Plots Nos. 3 and 5, the Experiments Supervision Committee directed that the results of these two plots should not be published.—Ed.

GLEN INNES EXPERIMENT FARM.

R. H. GENNYS, Manager.

This experiment was sown on 6th July, 1911, with Algerian oats at the rate of 40 lb. to the acre.

The season was all that could be desired for the early varieties of oats, such as Algerian, and excellent yields were obtained. No rust was present, and the harvest conditions were exceptionally favourable. The yields are shown in the attached tables.

The outstanding feature of this experiment was the beneficial effect of superphosphate. The increased growth resulting from the application of this fertiliser could be noticed from the time of germination up till harvest time. It increased the stooling capacity, and the crop ripened earlier.

The application of sulphate of potash, or dried blood, singly or in combination, only slightly influenced the yield; but either of the above in combination with superphosphate proved beneficial. Superphosphate *mainly* increased the yield of hay, whilst dried blood, or sulphate of potash, tended to increase the yield of grain, having little or no influence on the yield of hay.

The application of sulphate of ammonia instead of dried blood, to supply nitrogen, has given a slightly increased yield, although no difference was observed between the plots during growth.

The above report deals with one year's experiment only, and the remarks cannot be considered as determined facts.

HAY YIELDS.

Plot No.	Manure per Acre.		Yield per Plot.	Yield per Acre.				Natural Yield.				Percentage Yield.
		lb.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	
1 (*Check*)	No manure	...	310	2	7	0	6	2	7	0	6	100
2 ...	Dried blood	45·5	327	2	9	2	15	2	7	0	1	105·58
3 ...	Superphosphate	100	468	3	11	0	4	2	6	3	23	151·28
4 (*Check*)	No manure	...	309	2	6	3	17	2	6	3	17	100
5 ..	Sulphate of potash	28·8	359	2	14	1	27	2	5	3	22	118·59
6 ..	Dried blood Superphosphate	45·5 100	478	3	12	2	6	2	4	3	26	161·29
7 (*Check*)	No manure	...	290	2	4	0	2	2	4	0	2	100
8 ...	Dried blood Sulphate of potash	45·5 28·8	303	2	5	3	27	2	6	1	16	99·13
9 ...	Superphosphate Sulphate of potash	100 28·8	401	3	0	3	13	2	8	3	2	124·8
10 (*Check*)	No manure	...	337	2	11	0	17	2	11	0	17	100
11 ...	Dried blood Superphosphate Sulphate of potash	45·5 100 28·8	485	3	13	2	13	2	10	2	5	145·6
12 ...	Sulphate of ammonia Superphosphate Sulphate of potash	29·4 100 28·8	509	3	17	1	1	2	9	3	21	154·71
13 (*Check*)	No manure	..	325	2	9	1	9	2	9	1	9	100

GREEN FODDER YIELDS.

Plot No.	Manure per Acre.		Yield per Plot.	Yield per Acre.				Natural Yield.				Percentage Yield.
		lb.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	
1 (*Check*)	No manure		669	5	1	2	5	5	1	2	5	100
2	Dried blood	45·5	682	5	3	2	2	5	0	0	8	103·44
3	Superphosphate	100	844	6	8	0	12	4	18	2	12	129·91
4 (*Check*)	No manure		640	4	17	0	16	4	17	0	16	100
5	Sulphate of potash	28·8	707	5	7	1	7	4	12	2	27	115·71
6	Dried blood Superphosphate	45·5 100	845	6	8	1	1	4	8	1	10	145·19
7 (*Check*)	No manure		553	4	3	3	21	4	3	3	21	100
8	Dried blood Sulphate of potash	45·5 28·8	559	4	4	3	11	4	6	3	14	97·6
9	Superphosphate Sulphate of potash	100 28·8	756	5	14	3	0	4	9	3	7	127·76
10 (*Check*)	No manure		611	4	12	2	27	4	12	2	27	100
11	Dried blood Superphosphate Sulphate of potash	45·5 100 28·8	768	5	16	2	8	4	11	2	25	127·09
12	Sulphate of ammonia Superphosphate Sulphate of potash	29·4 100 28·8	803	6	1	3	15	4	10	2	24	134·3
13 (*Check*)	No manure		591	4	9	2	23	4	9	2	23	100

GRAIN YIELDS.

Plot No.	Manure per Acre.		Yield per Plot.	Yield per Acre.	Natural Yield.	Percentage Yield
		lb.	lb.	bus.	bus.	
1 (*Check*)	No manure		94	39·95	39·95	100
2	Dried blood	45·5	128	54·4	45·19	120·38
3	Superphosphate	100	141	59·92	50·43	118·81
4 (*Check*)	No manure		131	55·67	55·67	100
5	Sulphate of potash	28·8	140	59·5	53·68	110·84
6	Dried blood Superphosphate	45·5 100	170	72·25	51·7	139·74
7 (*Check*)	No manure		117	49·72	49·72	100
8	Dried blood Sulphate of potash	45·5 28·8	118	50·15	50·85	98·62
9	Superphosphate Sulphate of potash	100 28·8	163	69·27	51·98	133·26
10 (*Check*)	No manure		125	53·12	53·12	100
11	Dried blood Superphosphate Sulphate of potash	45·5 100 28·8	149	63·32	50·43	125·5
12	Sulphate of ammonia Superphosphate Sulphate of potash	29·4 100 28·8	149	63·32	47·74	132·6
13 (*Check*)	No manure		106	45·05	45·05	100

NYNGAN DEMONSTRATION FARM.

E. BARING, Experimentalist.

For this experiment the land was cleared in 1911, disc-ploughed 6 inches deep in February, and broken down with spring-tooth cultivators and harrows. The variety of wheat used was Steinwedel, and the plots were sown on 29th May, 1911.

The following table shows the manuring of each plot, and the results :—

TABLE OF RESULTS.

Plot No.	Manure per Acre.		Hay Yield per Acre.			Grain Yield per Acre.		
			Computed.	Natural.	Percentage.	Computed.	Natural.	Percentage.
		lb.	lb.	lb.		lb	lb.	
1 (*Check*)	No manure		1,287·5	1,287·5	100	294	294	100
2	Sulphate of ammonia	25	1,262·5	1,334·2	94·62	237·5	258·5	91·49
3	Superphosphate	50	1,350	1,380·8	97·77	228	223	102·24
4 (*Check*)	No manure		1,427·5	1,427·5	100	187·5	187·5	100
5	Sulphate of potash	15	1,421	1,410	100·78	219	214·7	102·00
6	Sulphate of ammonia Superphosphate	25 50	1,550	1,392·5	111·31	247	241·8	102·15
7 (*Check*)	No manure		1,375	1,375	100	269	269	100
8	Sulphate of ammonia Sulphate of potash	25 15	1,350	1,350	100	275	290·8	94·56
9	Superphosphate Sulphate of potash	50 15	1,427·5	1,325	107·72	316	312·7	101·05
10 (*Check*)	No manure		1,300	1,300	100	334·5	334·5	100
11	Sulphate of ammonia Superphosphate Sulphate of potash	25 50 15	1,427·5	1,300	109·87	278	339·7	81·83
12	Dried blood Superphosphate Sulphate of potash	130 50 15	1,427·5	1,300	109·87	247	344·8	71·63
13 (*Check*)	No manure		1,300	1,300	100	350	350	100

The Prickly Pears of Interest to Australians.

J. H. MAIDEN,
Government Botanist, and Director of the Botanic Gardens, Sydney.

No. 5.—The Velvety Prickly Pear (*Opuntia tomentosa*, Salm-Dyck).

RAILWAY passengers in Queensland can hardly fail to notice near Helidon (between Toowoomba and Brisbane), between Warra and Dulacca on the Western line, and near Gracemere and other places on the Central line, a tall, dark, handsome-looking species with orange-red flowers. This is the Velvety Prickly Pear, as may be ascertained by stroking the joints with the tip of the finger.

It may attain a height of 20 feet, and its dark "foliage" contrasts with that of the Pest Pear, in the midst of which it often towers.

The following is a translation of a technical description of it, taken from Schumann's "Gesamtbeschreibung der Kakteen," p. 708:—

> Shrubby, erect, much-branched, large, green, with obovate or elongated lanceolate hoary articles; prickles generally none; flowers and berries red.
>
> Shrubby-erect, much branched, up to 2 m. high (this is 6 feet 6 inches, but it grows three times as high in Australia.—J.H.M.) Joints up to 20 cm. long, and 10 cm. broad, obovate to lanceolate, with short soft hairs, faintly puckered, pure green. Areola circular, covered with a short yellow-brown wool-felt. Glochidia dark yellow. Prickles mostly wanting, rarely solitary, thin, yellow, 1·8 mm. long.
>
> Length of the whole flower, 5 cm. Ovarium emerald green, velvet-like, 2½ cm. long. Areola orbicular, covered with black, short wool-felt. Glochidia yellow. Floral envelope, 5 cm. in diameter. Outer floral leaves scaly, thick, fleshy, yellow-green, with glochidia in the axils, inner ones egg-shaped, greenish brown at the base, otherwise carmine red, with a lighter margin, velvety, the innermost ones broad spathulate, blunt and emarginate, sharply toothed, silky glossy, flame-coloured. Stamens longer than half the floral envelope, the filaments white or rose-coloured, the anthers canary yellow. Style strong, dark carmine in colour, longer than the stamens, with five or six white stigmas.
>
> The berry ripens in a year; it is egg-shaped, puckered, felty, dirty carmine red, sweetish. Seed nearly orbicular, brownish yellow, 4 mm. in diameter.
>
> It certainly is found native in Mexico. It flowers at La Mortola, Italy, in July.

It has been sent to me from Europe as *Opuntia lurida* (on account of it dark appearance), and also as *O. pubescens* (on account of its pubescence) but both names are erroneous.

It is not found in New South Wales, so far as I have observed, but it is rather common in Queensland, and it is found in South Australia. Further records of its occurrence are desirable.

Besides the Queensland localities already quoted, it is found near the waterworks at Warwick, and near Goondiwindi. It is plentiful at Gracemere, near Rockhampton.

I have seen it at Dutton Bay, west of Port Lincoln, South Australia. It is evidently this species which in the *Journal of Agriculture of South Australia*, April, 1910, is figured as the "Spineless Cactus at Angoorichina," in the Far North.

Mr. J. V. Whyte, of Blinman, in that State, spoke to me of what I believe to be this species; he called it the "Peach Prickly Pear," and spoke of its fruit as very pleasant, and much appreciated by human beings, "but we have to get up very early in the morning to get ahead of the birds."

It is what is called a "tree" pear, and is not a pest in any sense. It is the tallest species known to me, although *Opuntia ficus-indica* forms a bulkier plant. I have often eaten the carmine-coloured fruits, which are rather small, and not bad flavoured.

It has few spines, and since the plants are large and isolated, they can be readily destroyed at any time by a poison-injection.

Berger says that it has been used for cochineal insect cultivation.

SORREL ON POOR SOILS.

A CORRESPONDENT from Lithgow sent down samples of soil for analysis, but the samples were too small for that purpose, though from observation the Chemist recommended manuring and the incorporation of vegetable matter to form humus. The correspondent subsequently stated that he was growing oats but was troubled with sorrel, and asked whether the use of coarse salt, which had been suggested to him, would be advisable.

Experiments made by this Department tend to show that it is almost impossible to do satisfactory work in attempting to treat crops in which weeds are growing. If sufficient salt were applied to kill the sorrel, it would be altogether too costly, and the oats would certainly be affected. Judging by the Chemist's reports regarding the soil, it is evident that the presence of so much sorrel is due, to a great extent, to the poorness of the soil, and I have no hesitation in saying that liming and manuring will do much towards eradicating this pest.—GEORGE VALDER.

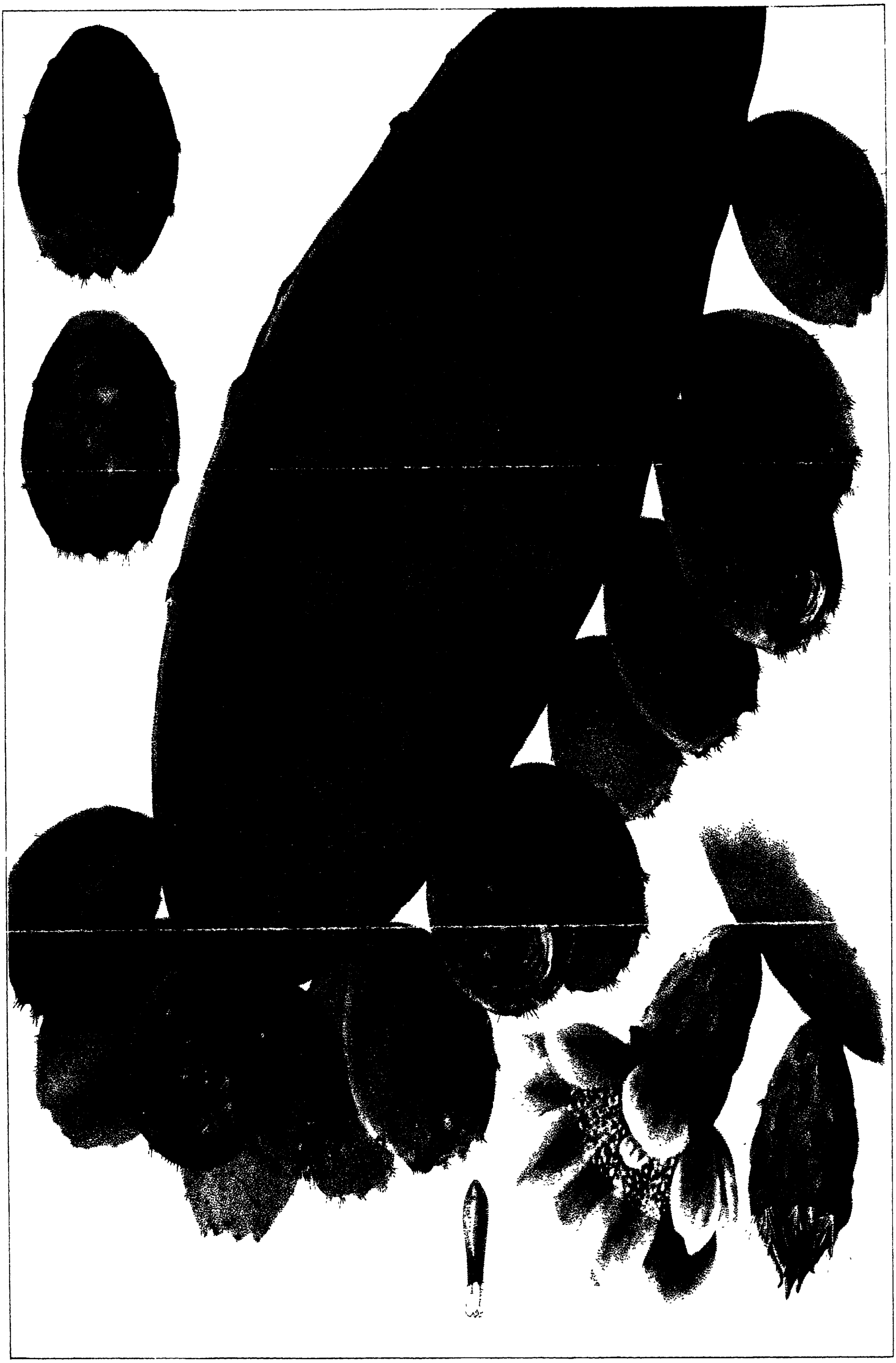
LIST OF AGRICULTURAL SOCIETIES IN SOUTH AFRICA.

THE Commonwealth Commercial Agent at Cape Town has supplied lists of the Agricultural Societies and Farmers' Associations in South Africa, and these have been sent to the New South Wales Department of Agriculture. Any body or firm desirous of doing business with South Africa may send a representative to peruse the list at the office of the Department, Bridge-street, Sydney.

THE COWPEA AS A HONEY PLANT.

MR. H. E. SMART, of Macksville, writes:—

> I note with interest the article on Cowpeas in *Agricultural Gazette* for November, 1910; but there is one important item omitted. No mention is made of this wonderful plant being rich in honey. Like most legumes it is rich in that respect; and as it is not ploughed in till after flowering full advantage can be taken of that point.



Wheat Cut at Different Stages.

EFFECT ON MILLING QUALITY.

F. B. GUTHRIE AND G. W. NORRIS.

WHEAT that has been bleached, either in the standing crop or in the stook after cutting, commands a lower price when sent to the mill. The results of an investigation into this matter were published in the *Agricultural Gazette* for November, 1912, and go to show that the deterioration lies principally in the reduced bushel-weight, and to a lesser extent in the gluten-content; but that otherwise the actual behaviour in the mill of samples of bleached and of unbleached wheat is very similar. This lowering in the bushel-weight is, however, a very serious one, amounting to 5 lb. per bushel, or even more, under normal conditions

The object of the present investigations was to ascertain whether it was not possible to harvest the grain at an earlier stage than is now customary without affecting its milling value. If the grain can be harvested in the dough stage, or even a few days before it is dead-ripe, it may mean in many cases the saving of the crop from the bleaching effects of unsettled weather at harvest-time.

In order to test the matter, arrangements were made with the Wheat Experimentalist and the Managers of some of the Departmental Farms to have samples of the stud wheats cut at two or three different stages and forwarded for purposes of milling and examination. This work has now been carried on for several years, and, as the samples tested include a fair number of different varieties grown in different localities from 1907 till last harvest, it is thought that any regular effects on the milling quality due to harvesting at different stages would have made themselves apparent.

If we now examine the table, we shall be able to judge to what extent any such effects are noticeable

Taking the bushel-weights, for example, we find that there is no regularity noticeable. The grain cut in the dough stage gives most frequently the heaviest sample, and in several cases the grain cut when dead-ripe is very much lower in bushel-weight, and has suffered from the weather. The weight of the samples cut in what is known as the milk-stage is nearly always low, and it does not seem desirable to cut at so early a stage as this.

With regard to flour-colour, there appears to be little or nothing to choose. It must be remembered that bleached grain frequently gives a better coloured flour than unbleached, and this is especially the case with the type of wheat examined, which is mostly of a yellowish tinge, and is improved by a slight bleaching. The figures within brackets in this column represent the order in which the flour-colours stand to the others of the same batch; but these differences, though noticeable, are generally very slight indeed.

The water-absorbing power (strength) is also very irregular and indefinite, nor can anything definite be said about the gluten-content, though in this latter case the figure is on the whole higher when the grain is harvested at the later stage of its ripening. The differences are, however, not sufficiently regular nor conspicuous to enable any definite conclusion to be drawn.

The conclusion to be drawn from these figures is that the milling quality of the grain is not greatly affected by the stage at which it is harvested, and that cutting before waiting for the grain to be dead-ripe is not likely to affect the quality of the grain to its disadvantage, but that on the contrary such a procedure will in many cases enable the crop to escape unfavourable weather conditions at harvest, which would have the effect of bleaching or pinching the grain. The most suitable time appears to be when the wheat is in the hard-dough stage; but it is only suggested that this might be done when the crop is threatened with rain, or with sudden and intense heat, when at its final ripening stage. Cutting at an earlier stage, when the grain is in the milk or soft dough stage, does not seem necessary, nor, as far as these figures show, desirable. Another advantage of harvesting early is that there is less danger of shelling and of loss in handling. The stripper, of course, cannot be used.

A further test was made by baking some of the flours obtained from the Cowra Farm harvest of 1909 into loaves. The varieties tested were Comeback (a hard wheat), Bunyip (a soft wheat), and Kubanka (a macaroni wheat). Half-pound loaves were baked of each of these varieties cut at different stages, and the volumes calculated to 1 lb. loaves. The volumes were taken by measuring the displacement of fine sand.

The following are the results:—

Variety	Stage of Cutting.	Volume of 1 lb. Loaf.
		Cubic Centimetres.
Comeback	Soft-dough stage	1511
" . .	Hard-dough "	1606
" . .	Dead-ripe "	1218
Bunyip	Soft-dough "	1301
"	Hard-dough "	1286
"	Dead-ripe "	1179
Kubanka	Soft-dough "	1225
"	Hard-dough "	1239
"	Dead-ripe "	1181

The tests made are too few to be in any way conclusive, and Kubanka is not, properly speaking, a bread wheat. In both the other cases the dead-ripe sample gave a smaller loaf, and the experiment serves, as far as it goes, to support the statement that cuttting at an early stage does not affect the baking quality of the resulting flour.

WHEAT CUT AT DIFFERENT STAGES.

Variety of Wheat.	Stage of Cutting.	Locality.	Year.	Weight per Bushel.	Percentage of Mill Products.			Nature of Flour.			Remarks.
					Flour.	Pollard	Bran.	Strength.	Colour	Gluten.	
				lb.	per cent	per cent	per cent.				
John Brown	Milk ..	Glen Innes	1907	57	67·6	17 6	14·8	51·	(2) .	13·26	Grain semi-translucent, pinched, long, soft. Dough inclined to be short, and greyish in colour.
,, ...	Dough ...	,, ..	,,	62·5	68·3	15·3	16·4	48·1	(1) ..	12 18	Grain translucent, large, plump, medium hard. Dough inclined to be short, but best of the three John Brown samples.
,, ...	Dead-ripe ..	,, .	,,	56·2	71·3	15·5	13 2	54·5	(3) ..	13·54	Grain slightly bleached, large, soft. Dough extremely short and of a low colour.
Jonathan ..	Milk .	,,	,,	63	68 5	18·6	12 9	51 9	(1) .	13 56	Grain translucent, plump, hard, small. Dough elastic, and of a rich cream colour.
,, ...	Dough .	,, ..	,,	65	71·9	13·5	14·6	52·7	(2) .	12·46	Grain translucent, small, hard, plump. Dough elastic, and of a rich cream colour.
,, ..	Dead-ripe .	,, .	,,	60½	67·5	18·0	14·5	51·3	(3) ..	14·77	Grain semi-translucent, and from dull-white to light-red in colour. Dough elastic and yellowish.
Power's Fife	Milk ...	,, ..	,,	58 2	70·5	20·2	9·3	55·9	(2) ...	13 9	Grain light-red, small, rather pinched. Dough tough and elastic.
,, .	Dead-ripe .	,, ..	,,	61·1	69·8	20 0	10·2	53·2	(1) ..	13·9	Grain red and brown, small, hard, plump. Dough tough and elastic.
Bobs ...	Dough ..	,, .	1908	64½	71·2	11 4	17·4	53·4	Fair (1) ..	11 7	Grain small, hard, translucent.
,, ...	Ripe ...	,, ...	..	62¾	72 0	13·2	14 8	50 2	Fair, grey tinge (3) .	12.5	Grain translucent, but there is a good percentage of black and partly sprouted germs.
,, ..	Dead-ripe ...	,, ...	,,	63¼	70·4	15·8	13·8	50·8	Fair (2) ..	12·2	Grain fairly translucent, hard, large, a large percentage with swollen germs. The sample cut at dough-stage has the best appearance.
Power's Fife	Dough ...	,, ..	,,	64¼	71·0	17·0	12·0	50	Fair, greyish tinge (3)	15·37	Grain bright, clear red, plump, hard, fair size.

WHEAT CUT AT DIFFERENT STAGES—*continued.*

Variety of Wheat.	Stage of Cutting.	Locality.	Year.	Weight per bushel.	Percentage of Mill Products.			Nature of Flour.			Remarks.
					Flour.	Pollard.	Bran.	Strength.	Colour.	Gluten.	
				lb.	per cent.	per cent.	per cent.				
Power's Fife	Ripe ...	Glen Innes ...	1908	62¾	70·0	17·2	12·8	50	Good, rather dark (2)	17·5	Grain similar in appearance to that cut in dough-stage.
,, ...	Dead-ripe ..	,, ...	,,	64½	72·3	14·5	13·2	50·6	Excellent (1) ...	15·36	Grain similar to other samples. All three are good-looking samples; perhaps the dead-ripe is the most attractive-looking sample.
John Brown	Dough ..	,, ..	,,	60¾	70·5	15·4	14·1	52·0	Fair, rather dull (3).	17·5	All three samples are very rough in the skin, and rather pinched, but contain a large amount of plump grain. There is no great difference noticeable in the appearance of these three samples of John Brown.
,, ...	Ripe ...	,, ...	,,	60½	70·6	15·2	14·2	53	Good, rather dull (2)	16 0	
,, ...	Dead-ripe..	,, ...	,,	60	70·7	15·8	13·5	51	,, ,, (1)	18·8	
Jonathan ...	Soft-dough	Cowra ...	1909	61	69·6	15·0	15·4	56·4	Excellent (1) ...	19·56	There is no very striking difference in these wheats, except that that cut at the soft-dough stage gives a considerably stronger flour than the others, and is slightly richer in gluten.
,, ...	Hard-dough	,, ...	,,	61½	70·1	14·4	15·5	51·4	,, (3) ..	19·50	
,, ...	Dead-ripe..	,, ...	,,	62	70·7	15·8	13·5	52·2	,, (2) ...	19·06	
John Brown	Soft-dough	,, ...	,,	59	67·0	18·0	15 0	55·8	Fair, rather dark (1)	19·88	There is not much to choose between the colours of these flours. The sample cut at soft-dough stage is rather the brightest in this respect. None of them are good. Strength good in all cases, especially in the case of the hard-dough sample.
,, .	Hard-dough	,, ...	,,	59	67·2	16·0	16·8	57	,, ,, (3)	18·95	
,, ...	Dead-ripe...	,, ...	,,	58½	68·6	17·7	13·7	55	,, ,, (2)	21·87	
Jonathan ...	Soft-dough	Wagga ...	,,	61	72·5	14·0	13·5	55	Good (2)	18·5	
,, ...	Hard-dough	,, ...	,,	61	70·6	16·4	13·0	57	,, (2) ...	18·2	
,, ...	Dead-ripe...	,, ...	,,	60¼	72·1	16 2	11·7	55	,, (1) ...	16·75	
Comeback ...	Soft-dough	,, ...	,,	62¾	70·9	16·6	12·5	55	Very good ...	13·81	The flour-colours of all three samples are so much alike as to be practically undistinguishable. The soft-dough stage of cutting gives the most satisfactory milling sample.
,, ...	Hard-dough	,, ...	,,	63	70·0	16·2	13·8	52·5	,, ...	13·29	
,, ...	Dead-ripe...	,, ...	,,	62½	7·20	16·1	11·9	53	,, ...	14·12	

Kubanka .	Soft-dough	Glen Innes	1909	65¼	73·7	9·1	17·3	55	Yellow	11·13	Baked a loaf of poor appearance and insufficient volume.
,, ...	Hard-dough	,, ...	,,	66	72·0	13·2	14·8	54·8	Yellow, rather dark	11·45	The bread produced by the hard-dough sample was a little better in appearance than that produced by the soft-dough sample.
,, ...	Dead-ripe...	,, ...	,,	63¼	71·6	14·8	13·6	55	Bleached appearance	11·26	The dead-ripe sample gave a very poor loaf.
,, ...	Dough-stage	Bathurst ...	,,	62¼	68·3	13 8	17·9	56	Very dark	16·68	The colour of flour produced at dead-ripe stage was the better of the two.
,, ..	Dead-ripe ..	,, ...	,,	62½	66·0	12·6	21·4	54	,, ...	17·57	
,, ...	Soft-dough	Wagga ...	,,	62¼	68·6	12·7	18·7	52·4	Dark yellow ...	18·50	All samples very similar in behaviour, and yield similar flour. Dead-ripe flour, colour rather low.
,, ..	Hard-dough	,, ...	,,	62¼	66·7	14·5	18·8	54·4	,, ...	20·17	
,, ...	Dead-ripe...	,, ..	,,	62¼	66·0	19·3	14·7	54·6	Very dark yollow ...	20·19	
,, ..	Soft-dough	Cowra ...	,,	61¾	68·4	15·8	15·8	56·8	Dark yellow ..	19·29	Flour-colour of dead-ripe sample very low.
,, ...	Hard-dough	,, ...	,,	62¼	71·8	11·4	16 8	54	,, ...	20·34	
,, ...	Dead-ripe...	,, ...	,,	62	70·6	18·9	10·5	55·6	Very dark yellow ...	20·29	
Jonathan ..	Soft-dough	,, ..	,,	58	74·0	15·0	11 0	55	Lighter than dead-ripe.	16·21	All very similar. Dead-ripe sample on the whole the best milling sample
,, ..	Hard-dough	,, ..	,,	58¾	70·7	13·6	15·7	54	Shade between soft and dead-ripe.	15 82	
,, ...	Dead-ripe...	,, ..	,,	58¾	73 2	17·9	8·9	56	Yellowish	17·15	
Bunyip	Soft-dough	Wagga ...	,,	60	72·9	14·1	13·0	49·0	Excellent	12·2	All three samples very similar in their behaviour in the mill. The flour colours are almost identical. The hard-dough is the heaviest, and has best flour-strength.
,, ...	Hard-dough	,, ...	,,	62¼	74·8	14·3	10·9	49·4	,, ...	12·2	
,, ...	Dead-ripe...	,, ...	,,	61¾	70·6	14·8	14·6	47	,, ...	12·5	
John Brown.	Soft-dough	,, ...	,,	58¼	68·4	14·6	16·9	55	Low	17·68	The bushel-weights low, flour yields unsatisfactory, and of a bad colour.
,, ...	Hard-dough	,, ..	,,	57¾	68·7	15·8	15·5	54	,, ...	18·12	
,, ..	Dead-ripe...	,, ..	,,	58¼	65·2	20·6	14·2	53·4	,, ...	17·29	
Comeback ...	Soft-dough	Cowra ...	,,	61½	71·5	14·3	14·2	54	Excellent (3) ...	14·5	The dead-ripe sample on the whole the best, the bushel-weight being highest and flour-colour best.
,, ...	Hard-dough	,, ...	,,	60¾	73·2	14·7	12·1	53·4	,, (2) ...	14·95	
,, ...	Dead-ripe...	,, ...	,,	62	72·3	14·0	13·7	53	,, (1) ..	16·2	
Bunyip	Soft-dough	,, ...	,,	58¼	67·5	20·0	12·5	47·8	,, ...	11·3	All three samples very similar in behaviour.
,, ...	Hard-dough	,, ...	,,	60¼	71·0	16·0	13·0	47·5	,, ...	11·8	
,, ...	Dead-ripe ..	,, ...	,,	59¼	71·3	14·2	14·5	47	,, ...	11·9	
John Brown.	Soft-dough	,, ...	,,	57	68·7	15·3	16·0	54	Low (1)	17·11	All samples very similar.
,, ...	Hard-dough	,, ...	,,	57	68·9	15·2	15·9	54·6	,, (2)	17·2	
,, ...	Dead-ripe...	,, ...	,,	58	69·2	16·2	14·5	54·6	,, (3)	17·01	

WHEAT CUT AT DIFFERENT STAGES—*continued.*

Variety of Wheat.	Stage of Cutting.	Locality.	Year.	Weight per Bushel.	Percentage of Mill Products.			Nature of Flour.			Remarks.
					Flour.	Pollard.	Bran.	Strength.	Colour.	Gluten.	
				lb.	per cent.	per cent.	per cent.				
Cedar ...	Soft-dough	Wagga ...	1910	62	70·1	15·0	14·9	56	(1) ..	19·5	The sample cut at soft-dough stage is on the whole the best milling sample. The colour of all three is similar. The soft-dough is somewhat the lightest, and is the highest in strength and gluten, yields flour well, and is of good bushel-weight.
,, ...	Hard-dough	,, ..	,,	63	73·2	13·4	13·4	54·6	(2) ..	18·16	
,, ...	Dead-ripe ..	,, ...	,,	63	74·1	12·4	13 5	55·0	(3) .	17·8	
Bunyip ...	Soft-dough	,, ..	,,	61¾	69·0	15·2	15·8	51	(3) .	14·0	The dead-ripe sample gives the best coloured flour, but is lower in strength and gluten. The sample cut in the hard-dough stage is the best milling sample.
,, ...	Hard-dough	,, ...	,,	64¼	72·5	14·7	12·8	51	(2) .	15·1	
,, ...	Dead-ripe ..	,, ..	,,	63¾	72·4	16 1	11·5	48 8	(1) ...	13·25	
,, ..	Milk-stage..	Bathurst .	,,	56	70·1	15·0	14·9	50	(1) ..	12·4	Dough-stage gives the heaviest grain, but is otherwise not quite so good a milling sample.
,, ...	Dough-stage	,, .	,,	62¾	68·0	14 7	17·3	48·2	(2) .	12·7	
Comeback ...	Milk-stage..	,, ...	,,	59	68·8	13·9	17·3	57 2	(1) ..	17·0	Dough-stage heaviest grain and strongest flour; not quite as good as milk-stage in strength and colour.
,, ...	Dough-stage	,, ...	,,	64	73·8	12 8	13·4	60 0	Deep yellow (2) ..	15·6	
Bunyip ...	Soft-dough..	Cowra ...	,,	61	72·0	13 9	14·1	48	Excellent (2) .	13·1	Hard-dough sample gives heaviest bushel-weight; otherwise no great difference between the three.
,, ...	Hard-dough	,, ...	,,	62 9	69·0	16·2	14·8	48	,, (3) ..	13·0	
,, ...	Dead-ripe..	,, .	,,	61·8	71·0	17·1	11·9	50	,, (1) .	12 9	
Comeback ...	Soft-dough	,, ..	,,	65 1	72·8	12·5	14·7	56	,, (2) .	18·7	Hard-dough sample on the whole the most satisfactory for milling.
,, ...	Hard-dough	,, ..	,,	64·8	71 1	13·0	15·9	57	,, (1) ...	17·4	
,, ..	Dead-ripe .	,, ...	,,	63·5	73 0	16·1	10·9	58	,, (3) ...	18·0	
Federation ..	Hard-dough	,, ...	1911	62 0	72·0	11 8	16·2	47	,, ..	15·1	The colour of flour from hard-dough is somewhat lighter than that of dead-ripe.
,, ...	Dead-ripe ..	,, ..	,,	61·8	73·5	13·0	13·5	47	,, ..	14·5	
Comeback ..	Hard-dough	,, ..	,,	65	75 8	12·6	11·6	55	(2) .	20·4	
,, ...	Dead-ripe.	,, ...	,,	65	74·0	15·4	10 6	55	(1) ..	19·7	
Warren ...	Hard-dough	,, ...	,,	62·5	70·4	15·0	14·6	48·6	(2) ..	17·0	
,, ...	Dead-ripe...	,, ...	,,	64 6	74·6	12·7	12·7	48 8	(1) ..	17·1	
Bunyip ...	Hard-dough	,, ...	,,	60·5	68 8	12·7	18·5	47·8	(2) ..	16 5	
,, ...	Dead-ripe ..	,, ...	,,	62·2	72 7	16 1	11·2	48	(1) ...	17·7	

Florence Wheat at Hawkesbury Agricultural College.

A. V. DONNAN, Experimentalist.

DURING the present harvest at the Hawkesbury Agricultural College some good yields are being recorded. On a small area in the Experiment Plots, Florence has given very good results as an early hay wheat.

The land, 1 acre in extent, varies in character from a fairly fertile sandy loam to a poor pipeclay loam. It had borne artichokes since 1908, and in July, 1911, after the pigs had been grazed on the year's crop, it was decided to plant wheat the following autumn.

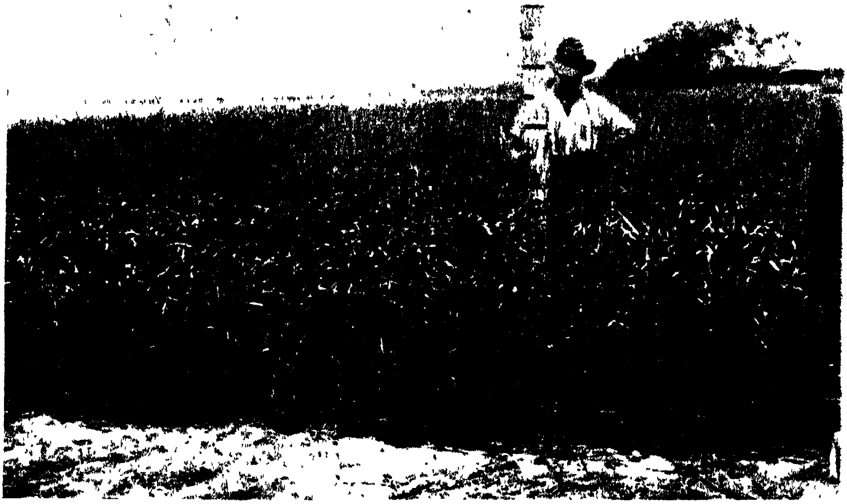


Fig. 1.—Florence Wheat, Hawkesbury Agricultural College, 1912.

After ploughing, the land was fallowed until May, 1912, during which time a little extra cultivation was entailed in exterminating the artichokes.

Just previous to sowing the land was lightly ploughed, harrowed and rolled. On the 15th May, 1 bushel of Florence wheat was drilled in without manure, light harrows following the seed drill.

The seed germinated strongly and evenly. The crop grew rapidly, and on 13th September the bulk was 5 feet high, and in full flower. On the 20th September the crop was cut with the reaper and binder, and stooked the following morning. Splendid weather was experienced for haymaking, and on 2nd October, four and a half months from planting, the crop was carted in, weighed and stacked; 2 tons 17 cwt. were obtained from the acre, the hay being of excellent quality.

The season experienced was abnormally wet in the early stages of growth, otherwise it was perfect. At harvesting time only very slight spring rust *(Puccinia rubigo-vera)* had developed on the wheat flag.

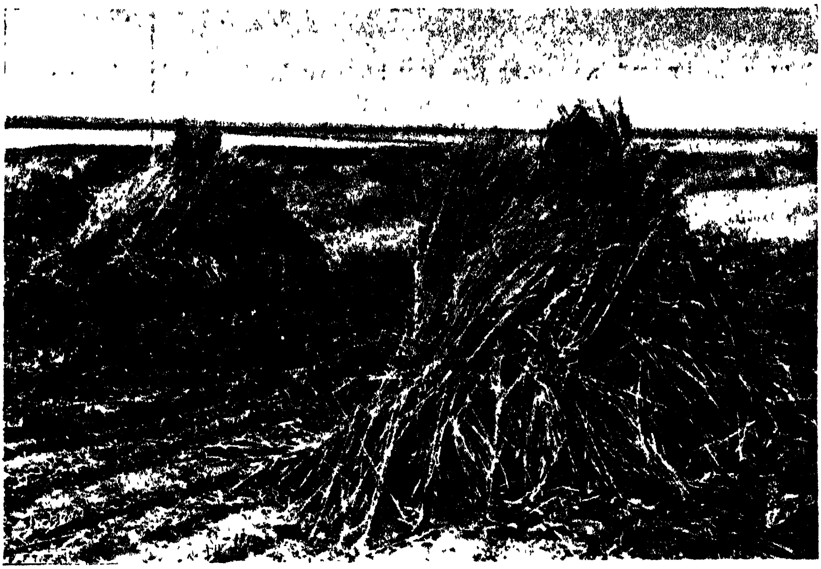


Fig. 2.—Florence Wheat in stooks, Hawkesbury Agricultural College, 1912. Yield 2 tons 17 cwt. per acre.

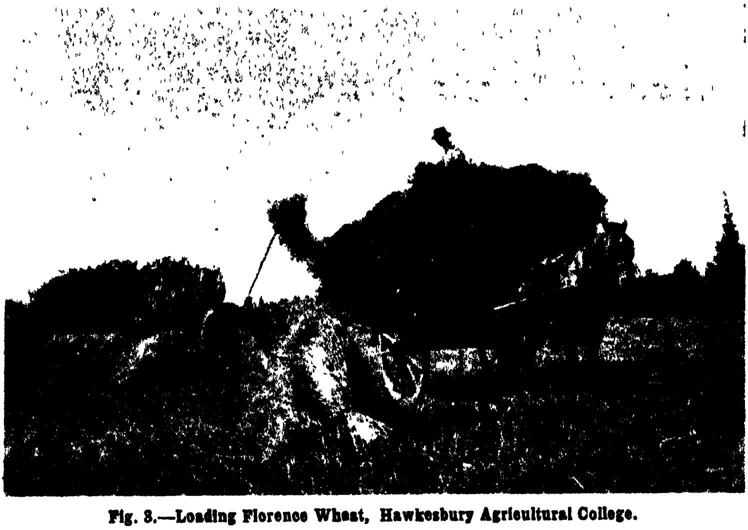


Fig. 3.—Loading Florence Wheat, Hawkesbury Agricultural College.

During the past few years, Florence has given such good results as to justify placing it with Thew and Firbank as one of the three best early varieties to grow for green fodder or for hay in this district. In addition to resisting rust to a small extent, it largely escapes it on account of its early maturity. It matures slightly ahead of Thew, and somewhat later than Firbank, while it is a heavy yielder and will make a first class sample of hay. Its tendency to shell detracts from its value as a grain wheat.

The crop was one of the earliest known in the district, and the partial use of such a quick maturing wheat has the outstanding advantage of lengthening the harvesting period, and thus more evenly distributing the labour necessary at this busy season of the year.

[NOTE.—Attention is drawn to the fact that this crop was grown on land which had been under artichokes, grazed by pigs, and manured with their excreta. The rotation and the manuring may have had considerable influence upon both the earliness of the crop and the high yield.—ED.]

TESTING A SOUTH COAST DAIRY HERD.

MR. M. WALLACE, Dairy Instructor on the South Coast, quotes the experience of Mr. A. Furtier, Nethercote, Pambula, to show the advantage of testing dairy herds. Mr. Furtier commenced dairying in November, 1904, and started testing on 24th January, 1905. His herd to start with was a grade one, on which he has used nothing but pure-bred Jersey bulls. He has now four heifers by the bull Melbaria milking, which he says are excellent.

During 1911 he had on his farm 47 cows and heifers, the highest number milking in any one month being 42, and the average for the twelve months being 38·75 cows in milk. The cattle are grazed on paddocks which have been laid down with artificial grasses, supplemented during dry periods with green maize carted on to the grass paddocks. Some sorghum and pumpkins are also grown, and during the winter green oats is the principal feed on which the cattle are grazed. Hitherto no weighing of the milk has been done, the cows being culled chiefly on the test and the time they ran dry.

The following are the returns for the year 1911 :—

Month.	No. of Cows in Milk.	Commercial Butter.	Month.	No. of Cows in Milk.	Commercial Butter.
		lb			lb.
January	40	919	August	40	1,262
February	39	1,067	September ..	40	1,322
March	40	1,226	October	40	1,600
April	33	935	November... ...	42	1,413
May	33	1,055	December... ...	40	1,141
June	38	1,193			
July	40	1,247	Total... ...	....	14,380

This is an average of 305·978 lb. for each of the 47 cows. There were 46 cows from January to May, when a 22 months old heifer came in.

Importation of Clydesdale Horses.

AT the request of the Minister of Agriculture (the Hon. J. L. Treflé, M.P.), the Agent General for this State in London arranged for the purchase in Great Britain of three Clydesdale stallions and three mares in foal. The object was to use the stallions for serving the best mares on Government farms, and with the progeny of the imported mares, to build up a Clydesdale stud for the benefit of the State.

Mr. Coghlan arranged for the purchases to be made by Messrs. John Thornton and Co., of London (who have made a number of purchases of stock for this Department), acting in conjunction with Messrs. Henderson and Dunlop, members of the Scottish Agricultural Commission which recently visited Australia.

Mr. Coghlan, in his letter of advice, states :—

> "I am assured by Messrs. Thornton and Company, and through them by Mr. Dunlop, that the animals secured are the finest Clydesdales in Great Britain, and are the type required for the proper development of the breed in New South Wales."

The horses were shipped per s.s. "Dorset," on 2nd August, and reached Sydney on 28th September, 1912. They landed in good condition, and were safely removed to the Stock Quarantine at Athol.

On 9th October, the Minister, accompanied by Departmental officers and press representatives, visited the Quarantine to inspect the horses, and the accompanying photographs were taken by the representative of the *Town and Country Journal.* The horses were found to be, on the whole, a very good lot, showing considerable differences from the type of Clydesdale bred in this State. The Minister expressed himself well satisfied with the purchase. The docility of the animals was particularly noticeable.

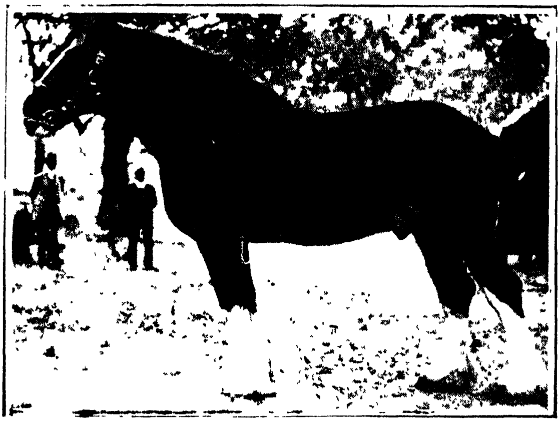
The following particulars of the imported horses are published for general information :—

1. Clydesdale Stallion. ROYAL WARDEN (16045).

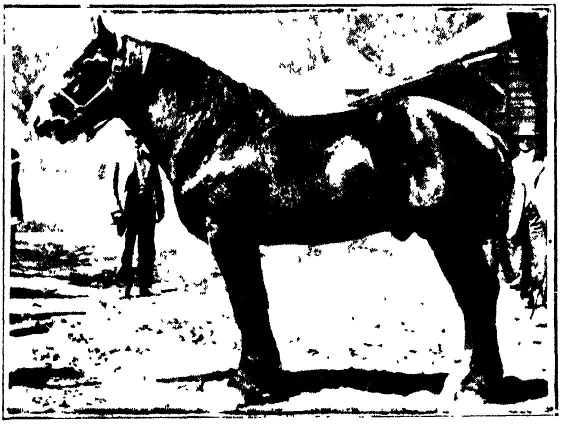
Sire, Everlasting (11331); 1st dam, Gem of Craigwillie (21597), by Prince Thomas (10262); 2nd dam, Lady Edith of Craigwillie (15687), by Prince of Carruchan (8151); 3rd dam, Jean of Northfield (18564), by Star of the North (2435); 4th dam, Cowden Jean (19435), by Clydesdale Jock (1415).

Royal Warden was purchased from Messrs. A. and W. Montgomery; price £420. He was foaled on 15th April, 1908; bred by Mr. James Merson, Craigwillie, Huntly, Aberdeenshire, Scotland. He was first and

Clydesdale Stallion, Royal Warden (Imp.).



Clydesdale Stallion, Clandale (Imp.).



Clydesdale Stallion, Robin Adair (Imp.).

IMPORTED CLYDESDALE STALLIONS.

Clydesdale Mare, May Allan (Imp.).

Clydesdale Mare, Nannie III of Fod (Imp.).

Clydesdale Mare, Greenfoot Jewel (Imp.).

IMPORTED CLYDESDALE MARES.

champion at the Royal Agricultural Show, Norwich, England, 1911. He is a bay, with white face, inside of near fore coronet white, off fore ankle and hind legs white.

Height, 17 hands; girth, 7 feet 4 inches; length, 6 feet 1 inch; bone, 10½ inches.

This is undoubtedly a fine animal, representing the modern light-boned, active type of Clydesdale. He was considered the most suitable type for mating with the mares at the Hawkesbury Agricultural College, and has been stationed at that institution.

2. Clydesdale Stallion. CLANDALE (14628).

Sire, Allandale (12418); 1st dam, May Logan (21199), by Prince Robert, (7135), 2nd dam, Haidee (21198), by Prince of Wales (673); 3rd dam, Jess of Portlogan (3145), by Lofty (460); 4th dam, Kate, by Hercules (378); 5th dam, a mare by Lord Raglan (494).

Clandale was purchased from Mr. Geo. A. Ferguson; price £450. He was foaled on 10th May, 1907; bred by Mr. Wm. Cochrane, Port Logan, Wigtownshire. He was first at Aberdeen, 1912. He is a bay, with white stripe on face, four white legs to knees and hocks, very small white spot on near side of girth.

Height, 17 hands 1½ inches; girth, 7 feet 4½ inches; length, 6 feet 1 inch; bone, 11 inches.

Clandale is thus a bigger horse than Royal Warden, and broader in the chest and hind quarters. He is undoubtedly a fine horse, and by some few of those present was considered to be the pick of the three, from an Australian point of view.

Clandale is stationed at Wagga Experiment Farm.

3. Clydesdale Stallion. ROBIN ADAIR (16013).

Sire, Royal Walter (13717); 1st dam, Rossie (19808), by Alexander Everard (11242); 2nd dam, Bell of Wester Deans (14652), by Prince of Brunstane (9977); 3rd dam, Darling of Wester Deans (14651), by Top Knot (6360); 4th dam, Blossom of Wester Deans (14649), by Stonelaw Lord Lyon (2440); 5th dam, Bell of Westside (23030), by Pride of Kyle (3904).

Robin Adair was purchased from Mr. C. Brydon; price £500. He was foaled on 30th May, 1909; bred by Mr. Thomas Lean, Wester Deans, Leadburn. He was selected by the Clydesdale Society of Scotland, as a typical Clydesdale for the International Horse Show at Olympia, 1912. He is a brown horse, with white stripe on face, white spot inside hoof, head half of near fore foot white, off hind leg white half way to hock.

Height, 17 hands 2 inches; girth, 7 feet 1 inch; length 6 feet 1 inch; bone, 10¾ inches.

Considering his height he is on the light side as compared with Clandale, but as he is a year younger than the other two stallions he may make this up. He is stationed at Bathurst Experiment Farm.

4. Clydesdale Mare. MAY ALLAN (31288);

Covered by DUNEIRE FOOTPRINT, the Champion Clydesdale of Scotland.

May Allan is a full sister to Clandale, whose pedigree is given above. She was purchased from Mr. Geo. A. Ferguson; price £125. She was foaled on 1st June, 1910; bred by Mr. Wm. Cochrane, Port Logan, Stranraer, Wigtownshire. She is a bay, with white face, fore legs white to knees, hind legs white to hocks.

This is a very pretty mare, with plenty of life. She looks fine as a two-year-old. She has been placed at the Hawkesbury Agricultural College.

5. Clydesdale Mare. NANNIE III. OF FOD (31359);

Covered by KEIR OF HARVIESTON.

Sire, Dunedin (12951); 1st dam, Nina I of Fod (17116), by Cawdor Cup (10045); 2nd dam, Nancy (14372), by Royal Signet (8967); 3rd dam Nancy Knight (7758), by Belted Knight (1395); 4th dam, Nina of Portnellan (2845), by Farmer (286); 5th dam, Nelly (1666), by Prince of Wales (673).

Nannie III of Fod was purchased from Mr. John Meikle; price £125. She was foaled on 5th May, 1908; bred by Mr. James S. Stenhouse, Fod, Dumferline, Fife.

This mare has also been placed at the Hawkesbury Agricultural College. Her appearance at present is not impressive, though she may improve as she picks up condition.

6. Clydesdale Mare. GREENFOOT JEWEL (31358); covered.

Sire, Baron's Voucher (12041); 1st dam, Blossom of Greenfoot (16333) by Gold Mine (9540); 2nd dam, Miss Errant (11014), by Knight Errant (4483); 3rd dam, Maggie of Greenfoot (5014), by True Blue (1334); 4th dam, Jess of West Plean (2922), by Donald Dinnie (1116).

Greenfoot Jewel was purchased from Mr. James Sands; price, £125. She was foaled on 1st May, 1909; bred by Mr. Sands at Greenfoot, Gargunnock, Stirlingshire.

This is a very nice-looking mare, and good value for the money paid. She is placed at the Hawkesbury Agricultural College.

Conditions of Service.

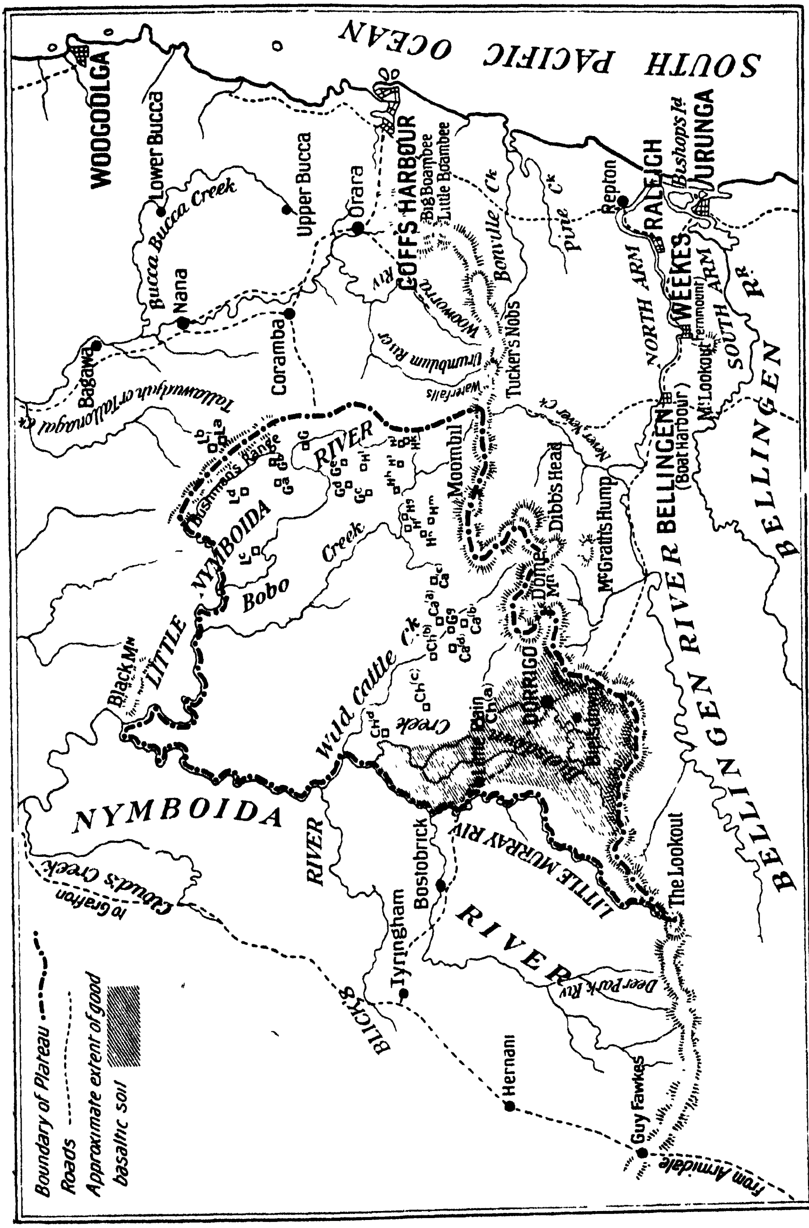
The Minister has decided that the two older stallions, Royal Warden and Clandale, will be allowed to serve six picked mares each for the public this year.

Robin Adair will be used for the Department's mares only.

Half a dozen private mares will be selected for service at Hawkesbury Agricultural College and Wagga Experiment Farm. The basis of selection will be soundness and conformity to type, as judged by officers of the Department of Agriculture. The exact terms are being arranged.

Analyses of Soils from Dorrigo.

IN 1906, when a large area of land in the Dorrigo district was being made available for settlement, Mr. F. B. Guthrie, Chemist of the Department of



Sketch Map of Dorrigo Plateau, showing approximately the positions in which the samples of soil were taken.

Agriculture, visited the area and took samples of soil for analysis. In addition, a number of samples were sent down by Messrs Loxton, Hall, Chard and Callaghan, Surveyors in the Department of Lands.

The table on page 1043 gives the analyses of these soils, and for reference purposes a sketch map has been prepared showing roughly the positions from which the samples were taken. The map published by Mr. George Marks, Inspector of Agriculture, in the *Gazette* for April, 1911, has been used as a basis, and the positions from which the various samples were taken have been indicated by letters. In each case the first letter is the initial of the officer who took the sample, and the second is the distinguishing mark. For example, "G (a)" means sample "a," taken by Mr. Guthrie; "H (b)", sample "b" taken by Mr. Surveyor Hall. Reference to the map will thus show approximately the position from which each sample in the table of analyses was taken.

In next issue, analyses will be published of samples from the area round Dorrigo itself.

ROSE MILDEW.

A COOTAMUNDRA grower recently sent a specimen from a Crimson Rambler rose suffering from disease. The Bureau of Microbiology reported :—

> The disease is "Rose Mildew," due to a fungus, *Sphærotheca*. It attacks the leaves, young shoots and flower buds, often curling the leaves. On the shoots, calyx and fruit the fungus forms thick, felty patches that persist late into the season, and here produces the small black bodies containing the spores to carry it over till the next year. Sometimes the disease occurs in two stages—the first after the leaves are formed, and the second when the young wood has made good growth and the flowers have commenced to appear. This is the critical period, and the fungus prepares to carry over the winter. Dusting with flowers of sulphur mixed with one-third of its volume of lime checks the disease. Spraying with sulphuric acid, one part in 1,500 of water, is one of the best remedies.
>
> Care must be taken in mixing or diluting sulphuric acid. Put the water in an earthenware or wooden vessel, pour the acid in slowly down the side, where it runs to the bottom, and then slowly stir.
>
> Other sprays used are lime-sulphur, and also liver of sulphur (sulphide of potassium).
>
> The Crimson Rambler is notably a sensitive rose to this disease.

NEW ZEALAND PROHIBITION AGAINST CROWN-GALL.

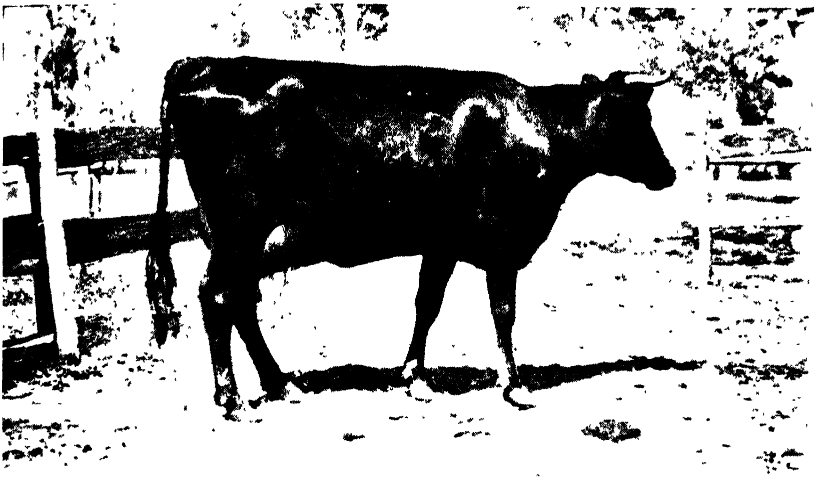
THE New Zealand Government has issued a proclamation prohibiting the introduction into the Dominion of any fruit or plants infected with the disease known as Root-knot, Hairy-root, or Crown-gall (*Bacterium tumefaciens*). If any plant, fruit, &c., affected is introduced or attempted to be introduced, it and any wrappings, &c., will be re-shipped or destroyed at port of entry. Re-shipment, however, is conditional on the approval of the inspector, and, in the event of destruction, the fees for such destruction are payable by the person in charge of the consignment.

ANALYSES OF SOILS FROM DORRIGO.

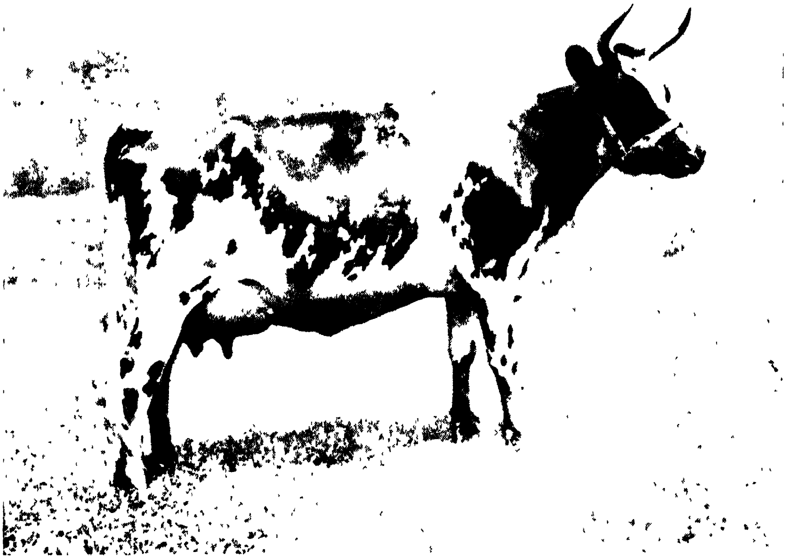
Distinguishing Mark.	Nature of Soil.	Colour of Soil.	Reaction of Soil	Water Capacity.	Capillary Power.		Clay.	Moisture.	Volatile and Combustible Matter.	Nitrogen.		Lime (CaO).		Potash (K_2O).		Phosphoric Acid (P_2O_5).	
				per cent.	inches		per cent.	per cent	per cent	per cent.		per cent.		per cent.		per cent.	
Mr. Guthrie's Samples:																	
G (a)..	Clay.	Grey.	Very strongly acid.	55	2·8	Poor	91·74	12·45	11·4	182	Good	·045	Bad.	·134	Satisfactory.	·125	Satisfactory.
G (b)	do.	do.	do	70	3	do.	91·00	5·55	6·85	·112	Satisfactory.	·057	indifferent	·078	Fair.	·128	do
G (c)	do.	do.	do.	63	3·5	Fair	83·47	11·32	9·13	210	Good.	·041	Bad.	·116	Satisfactory.	·097	Fair.
G (d)	do.	Light brown.	do.	75	4·8	do	92·88	17·35	18·8	·392	do	·047	do.	·068	Fair.	114	Satisfactory.
G (e)	Heavy Loam	Red.	Strongly acid	53	7	Good	68·64	2·55	10·77	070	Fair.	·029	do.	097	do.	118	do
G (f)	Clay	Chocolate	Very strongly acid	48	8·5	Very good	96·74	8·95	21·30	322	Good	·037	do.	039	indifferent	·351	Good.
G (g)	do	Brown.	do.	66	4·5	Fair	88·34	7·65	21·05	308	do	063	indifferent	·027	Bad.	157	Satisfactory.
G (h)	Heavy Loam	Red	do.	54	8	Good.	65·34	5·1	11·55	042	Deficient	040	Bad	·027	do.	·208	Good.
Mr. Surveyor Loxton's Samples:																	
L (a)	Heavy Loam	Chocolate.	Acid.	60	3·6	Poor.	61·2	7·0	21·7	421	Good.	·403	Satisfactory.	149	Satisfactory.	324	Good.
L (b)	Loam.	Brown	do.	51	5·4	Good	32·5	3·57	10·65	208	do	·543	Good	·149	do.	·219	do.
L (c)	Heavy Loam	do	Very strongly acid.	67	5	do	66·87	2·5	12·3	123	Satisfactory.	·043	Bad.	091	Fair.	·118	Satisfactory.
L (d)	Loam	do	do	65·5	6·2	Very good	53·0	6·52	21·5	·250	Good	141	Satisfactory.	·100	do.	·217	Good.
Mr. Surveyor Hall's Samples:																	
H (e) and (h)	Clay.	Yellow.	Very strongly acid	68	5·2	Good.	95·96	8·63	19·25	35	Good	017	Bad.	079	Fair.	·171	Satisfactory.
H (i), (j), (k) and (l)	do.	do.	do	60	4·7	Fair.	86·59	12·3	15·86	·308	do.	022	do.	091	do.	·186	do.
H (m)	Extremely stony and gravelly	Light brown.	do.		2·75	Poor.		6·18	24·1	·304	do	016	do	158	Satisfactory.	·104	do.
H (n)	Clay.	Yellowish brown	do.				92·07	3·19	18·07	·294	do	016	do.	·087	Fair.	·097	Fair.
H (c)	do	Grey.	do.		5·25	Good	94·33	2·28	13·95	175	do	063	indifferent	110	Satisfactory.	·082	do
H (d)	do.	Light brown.	do.	.	4	Fair	89·93	7·96	14·19	·217	do	028	Bad.	133	do.	·059	do.
H (z)	do.	do.	do		4·75	Good	76·24	2·71	13·00	217	do.	041	do.	·213	Good.	·091	do.
H (a) and (b)	do.	Greyish black.	do.	66·5	6	Very good.	75·11	5·16	23·6	·392	do.	033	do.	098	Fair.	·069	do

ANALYSES OF SOILS FROM DORRIGO—*continued.*

Distinguishing Mark.	Nature of Soil.	Colour of Soil.	Reaction of Soil.	Water Capacity.	Capillary Power.	Clay.	Moisture.	Volatile and Combustible Matter.	Nitrogen.	Lime (CaO).	Potash (K_2O).	Phosphoric Acid (P_2O_5).
Mr. Surveyor Chard's Samples:				per cent.	inches.	per cent.	per cent.	per cent.	per cent	per cent.	per cent.	per cent.
Ch (a) . .	Clay.	Chocolate.	Very strongly acid	62·0	10 Excellent.	87·44	3·7	16·3	·152 Good.	·015 Bad	·062 Fair.	·123 Satisfactory.
Ch (b) . .	do.	Brown.	do.	52·0	7·5 do.	93·53	4·17	17·47	·322 do.	·013 do.	·058 do.	·091 Fair.
Ch (c)	do.	do.	do	46·0	6·5 do.	80·9	3·42	14·08	·152 do.	·001 do.	·120 Satisfactory.	·076 do.
Ch (d)	do.	do.	do.	49·0	3·5 Poor.	78·76	2·26	11·05	·081 Fair.	·025 do.	·254 Good.	·067 do.
Mr. Surveyor Callaghan's Samples:												
Ca (a) . ..	Clay.	Dark brown.	Very strongly acid.	69·0	8 Excellent.	85·37	5·0	26·15	·407 Good.	·013 Bad.	100 Satisfactory.	·110 Satisfactory.
Ca (b)	do.	Red.	do.	61·0	7 do	96·6	4·2	19·75	·336 do.	·023 do.	·085 Fair.	·080 Fair.
Ca (c) .. .	do.	Light.	do.	50·0	4·25 Good.	92·01	7·65	23·74	·413 do.	·064 indifferent	·110 Satisfactory.	·234 Good.
Ca (d) . .	do.	Reddish.	do.	42·0	4·5 Good.	91·75	3·98	16·91	·266 do.	·055 do.	092 Fair.	·288 do.
Ca (e) .	do.	Light.	do	39·0	4·25 Good.	89·23	3·76	16·26	·252 do.	·028 Bad.	·344 Good.	·160 Satisfactory.



Shorthorn Cow, Waratah.
Sire: Dora's Boy; Dam: Australian Pansy.



Ayrshire Cow, Ripple Rose.
Sire: Prince Emerald (Imp.); Dam: Roseberry.

BREEDS OF DAIRY CATTLE.

Guernsey Cow, Calm II.
Sire: Rose Prince (Imp.), Dam: Gentle (Imp.).

Guernsey Cow, Rose Vivid.
Sire: Rose Prince (Imp.); Dam: Vivid (Imp.).

BREEDS OF DAIRY CATTLE.

Breeds of Dairy Cattle.

YEAR'S RECORDS AT BERRY EXPERIMENT FARM.

M. A. O'CALLAGHAN.

PROBABLY at no previous time in the history of New South Wales has cattle-breeding for dairy purposes been given so much attention as at present. This is no doubt due to the now generally recognised fact that improvement in our dairy cattle to any extent can only be brought about by the adoption of those methods which have been proved successful, not only in other countries, but also on specially managed farms throughout Australia.

The quickest economical way of improving our cattle is through the selection of pure-bred sires which have descended for at least three generations from parents, the female ancestors of which have been good milkers themselves, and from male ancestors whose female relatives have shown themselves to be animals capable of producing large quantities of milk and butter. I have shown, by experimental work, that bulls bred on these lines are capable, not only of producing animals that will yield large quantities of milk and butter, when mated with ordinary cross-bred dairy cattle, but are also capable of producing a fair percentage of good dairy cows even when mated with animals that have been bred on beef lines.

Necessity for the Keeping of Records.

Before, however, the farmers of New South Wales will be in a position to select young bulls from breeders, on sound lines, it will be, on the face of it, an absolute necessity that the breeders themselves shall be able, to show the records of the herd and shall also be able to prove that such records are authentic. Hence, before we can expect much progress, we must see that all pure-bred cattle from whom bulls are annually sold shall have records which will be made known to intending purchasers.

"Novelty," Dexter-Holstein cross.

The Americans have given this subject considerable attention of late, and so necessary do they deem it that the records of high-priced stud animals should be known, that a bill has been introduced into the United States Congress giving the Government of that country complete supervision over Herd Books and Breed Record Societies. Breeders of high-class Jerseys and Guernseys in the United States, who are prepared to show records of their animals, object to the importation and to the registration in Stud Books of animals whose ancestors were known to be inferior dairy cattle; and if this Bill becomes law, there is little doubt but that we shall see a revolution in that country in the show yard system of judging some of the most noted dairy breeds. Whereas it may not be necessary to invoke the powers of Parliament to do anything of a similar kind in this country, still there is ample evidence that show judging is frequently carried out on lines that are not calculated to improve the milk and butter yields of the dairy stock of Australia. As a matter of fact, too much attention is given to beauty, and too little to utility. If we were in a position to know the performances of our dairy cattle in the same way that breeders of race horses know the performances of thoroughbreds, we would then be in a position to judge stud dairy bulls and cows on much better lines than we are to-day; and a bull, for instance, that showed a very pretty head and a handsome outline, unless his female ancestors had some record at the milk pail, or his male relatives had some records of note at the stud, would have little chance of gaining a blue ribbon against what may be more plain-looking beasts, but at the same time have better blood in their veins as far as the purpose for which they were bred is concerned.

Fashions and Fancies in Dairy Cattle.

This brings us to a question to which dairy farmers of experience must have given some thought of late years, namely, the rapidity with which one breed of cattle comes into favour and another goes out of favour. Fashions in individual breeds of cattle change so rapidly that it is almost impossible for a breeder to continue devoting his attention to productive capacity, if he at the same time wishes to be successful in the show ring.

Take Jerseys, for instance. At one time animals that were almost entirely black in colour held pride of place in the show ring; then silver greys became fashionable; and later on golden fawns were in most request. It is manifestly evident that in order to keep up-to-date in these changes of fashion, a breeder would require to be constantly introducing new blood, and he would have to purchase his sires more for their colour than on the milk yields of their female ancestors. Needless to say, breeding on these lines can never lead to the most successful results as far as productive capacity is concerned, and whereas, probably, we have not been so much affected by these fashion crazes in Australia as in other countries, still there is no gainsaying but we have been affected by them, and, as far as I can see, adversely so.

The same may be said of the Ayrshires. At one time all the demand was for Ayrshires almost white in colour, and breeders had to steer their course accordingly. Now, however, the fashion in Australia has gone to the other extreme, and animals that are almost entirely brown, or reddish-brown, in colour, are given preference over all others. While favouring the latter colour in preference to the former for this country, nevertheless it must be pointed out that if we breed for colour, no matter what the colour is, we must ignore on many occasions animals of high productive powers, and therefore we are limiting our selection, and are making it more difficult to get animals of the best dairy class.

What has been said regarding the changes of fashion in individuals representing a breed, is also true as far as the breeds themselves are concerned. At one time we find a great demand for animals of the Jersey breed, whereas probably a couple of years previously all the demand was for animals of a Shorthorn type. Again, we all remember when Ayrshire cattle were the popular fancy.

The dairy farmer allows himself to be too easily affected by side issues. For instance, when store cattle are dear and good prices are obtainable for animals that are a fair size, and of what are known as good colours, we find the Shorthorn commanding most attention from those purchasing young bulls. On the other hand, when the prices for stores dropped to such an extent that it did not pay to rear steers on dairy farms, then all the demand set in for the specialised dairy breeds, such as the Jersey, the Guernsey and the Ayrshire. Breeding after this fashion, without any definite policy, must lead the dairy farmer into trouble if his aim is to produce a herd of cattle capable of giving large milk and butter yields. His policy should be fixed, not by the price obtainable for male store cattle, but by the quality of his land, the rainfall prevailing in his district, and the purposes for which he is producing milk. All other matters are side issues, which change so rapidly that it does not pay him to cater for them, and he will be well advised if he devotes all his attention to the improvement of his herd from a productive point of view, while at the same time paying due attention to the constitution and health of his stock.

Dairy Records of Different Breeds

The records of the stud cattle at Berry Experiment Farm for the twelve months ended 30th June, 1912, should prove interesting reading, and should form material for deep study by those dairy farmers and breeders who desire to give the improvement of their herds proper attention.

Individual Butter Yields.

The returns show that, judging from a butter point of view, the best cow in the herd was the Berry-bred Guernsey, Calm II (by Rose Prince, Imp.), she having yielded the very high return of 503 lb. of butter in a milking period of 41 weeks, despite the fact that she was for ten days at the Sydney show, which had a certain deteriorating effect on the milk supply.

The second best cow was also a Guernsey animal, the imported cow, Parson's Red Rose, which gave 452 lb. of butter in a milking period of 51 weeks.

The Jersey cow, Egypt's Glory (by Sir Jack) takes third place on the list, with 450 lb. of butter for a milking period of 60 weeks, but estimating it for the twelve months the result has been placed at 430 lb. of butter.

Another Guernsey cow, Bell Air VI (Imp.) was fourth, with 411 lb. butter, over a milking period of 46 weeks.

Fifth place for the milking period limited to twelve months is filled by a Guernsey heifer, three-quarter sister in blood to Calm II, with a butter yield of 402 lb. in 47 weeks, and she was then not dry.

Sixth place went to the imported Guernsey cow, Beatrix XIV, with 400 lb. butter for a milking period of 50 weeks.

The Berry-bred cow, Rose Vivid (by Rose Prince, Imp.) was seventh, with 406 lb. butter in a milking period of 60 weeks, or 386 lb. for the twelve months period.

Eighth place went to the Jersey cow, Calceolus, with 397 lb. of butter for a period of 56 weeks, or 385 lb. for the twelve months period.

The Guernsey cow, Belle Heiress, gave 385 lb. butter, and therefore tied with the Jersey cow, Calceolus, for eighth place.

Tenth place went to the imported Irish Shorthorn cow, Gibson Girl, with 380 lb. butter in a milking period of 42 weeks.

Individual Milk Yields.

The butter cow is the one that pays the best for the dairy farmer who supplies all his milk or cream to a butter factory, but for the supply of milk to towns the cow that pays best is the one which gives the largest quantity of milk of the standard quality.

The first place under this heading is secured by the imported Irish Shorthorn cow, Gibson Girl, with 9,291 lb. of milk at an average test of 3·5 per cent. Second place goes to a Holstein cow named Dutch Oven, with 8,671 lb. of milk, at an average test of 3·6 per cent. The Ayrshire cow, Leaf Bud, takes third place in the milking yield, with 8,389 lb. of milk, at an average test of 3·4 per cent., whereas the Guernsey cow, Calm II, comes fourth with 7,548 lb. of milk, testing 5·8 per cent. of butter fat.

Commercial Values.

(1.) *For Butter Purposes.*—Calculating butter as worth 10d. per lb., and separated milk at 1d. per gallon, the best cow in the herd, namely, Calm II, returned £23 12s. 6d. Comparing this with the worst mature cow in the herd, which was an imported Guernsey that gave only 142 lb. of butter, we get £6 18s. 4d. as her money value. As showing the great necessity for the individual testing of cows, it may be pointed out that this latter animal was selected as a heifer in England by good judges of dairy cattle, and to all appearances is a fair cow; yet compare her results with those of really good cows, and it is seen that while a herd of those like the first ten would readily make a fortune for a dairy farmer, a herd of the inferior kind would only cause him to lead a life of hard work with very poor pay.

(2.) *For Milk Purposes.*—Estimating new milk as being worth 8d. per gallon, the imported Irish Shorthorn cow, Gibson Girl, would have been worth £30 for the year; the Holstein cow, Dutch Oven, would have been worth £27 19s. 4d.; whereas the Ayrshire cow, Leaf Bud, would have been worth £27 0s. 8d.

Averages of the Different Breeds.

Taking the 21 Guernseys, of which 5 were on their first calf, and amongst which there was really only one bad beast, we find that the butter average comes out at 339 lb. The 4 Holsteins, 2 of which were on their first calf, averaged 294 lb. of butter each. The 11 Jerseys averaged 259 lb. of butter each, and amongst their number were 4 heifers on their first calf. The 6 Ayrshire cows, of which 2 were on their first calf, averaged 250¼ lb. of butter; while the 12 Shorthorns, of which 3 were on their first calf, averaged 227 lb. of butter each.

The average milking yields were as follows:—

4 Holsteins	7,387 lb. each.
6 Ayrshires	5,870 " "
21 Guernseys	5,711 " "
12 Shorthorns	5,419 " "
11 Jerseys	4,064 " "

The lesson to be learned from these figures, apart from that indicating the great necessity for individual testing, is that the dairy farmer should choose his breed according to the special section of dairying which he desires to take up. It is thus seen that the stud cattle at Berry, which are either imported stock or directly descended therefrom, teach us that, for butter making purposes, the butter breeds take precedence, whereas for the supply of milk in large quantities the Shorthorn, Holstein, and Ayrshire occupy a position higher than do butter breeds like Guernseys and Jerseys.

An important feature of the records is the fact that the two imported Irish Shorthorn cows stand right out from the descendants of the English Shorthorn cows in their butter yields, the reason being that the Irish Dairy Shorthorns are bred for productive capacity only, whereas the English Coates Herd-book pedigree Shorthorns are bred for type and character as much as they are for milk and butter yields.

It may be worthy of note by dairy farmers that all the bulls doing stud duty on the Government Experiment Farms, as well as those that are offered on lease, are the progeny of the heaviest milking families, as shown by these returns.

BERRY EXPERIMENT FARM STUD CATTLE.

Cow's Name.	No. of Weeks in Milk.	Milk.	Average Test.	Butter.
Guernseys—		lb.	per cent.	lb.
Calm 2nd	41	7,548	5·8	503
Bel Air 6th (imp)	46	6,818	5·2	411
Belle Heiress	50	6,407	5·1	385†
Shamrock of Les Vesquesses 6th (imp.)	41	4,941	4·9	285
Rohair Lassie (imp.)	42	5,537	5·1	333
Rose Vivid	60	6,617	5·2	406
Princess Vivid	58	6,229	4·6	337
Vivid 2nd	39	4,630	5·4	333
Parson's Red Rose 1st (imp.) ...	51	6,999	5·5	452
§Rose Petersen	37	3,576	5·3	228

† Cows on their first calf period.

§ Rose Petersen gave birth to a dead calf. The previous season she yielded 5,272 lb. milk, which tested equal to 283 lb. butter.

BERRY EXPERIMENT FARM STUD CATTLE—*continued.*

Cow's Name.	No. of Weeks in Milk.	Milk.	Average Test.	Butter.
Guernseys—continued.		lb.	per cent.	lb.
Rosey 8th (imp.)	44	5,611	4·7	311
Beatrix 14th (imp.)	50	6,791	5·0	400
Princess May (a three-quarter sister to Calm 2nd)	...	6,811	5·1	410
Angel Vivid...	36	5,093	5·3	318
Saucy Rose ...	...	6,810	4·5	360†
Flower of the Preel 3rd (imp.)	40	6,137	4·6	332*
Desdomona 8th (imp.)	37	6,721	4·3	340*
Beechwood Pearl (imp.)	...	5,547	5.0	327
Beatrice of Berry	...	5,566	5·5	362†
Shamrock of Illawarra	26	2,791	4·4	144†
Muriel 19th (imp.)...	23	2,759	4·4	142
Ayrshires—				
Miss Prim	34	5,834	3·4	232
Scotch Heather	41	4,345	3·9	203†
Hattie Craig	36	3,171	3·8	141†
Primrose 2nd	44	6,420	3·6	271
Leaf Bud	39	8,389	3·4	333
Ripple Rose...	34	7,063	3·9	323
Shorthorns—				
Waratah	...	6,293	3·7	273
Forest Pansy	41	5,785	4·0	271
Fauvette	45	7,132	2·7	223
Panacea	36	4,240	4·0	199†
Dora Dora	28	2,379	3·6	100†
Pansy Girl	39	5,405	3·5	221
Flower Girl (late Dora's Flower)	40	4,511	3·7	195
Dora Hampton	36	2,649	4·0	124†
Dora	41	5,196	3·4	207
Dewdrop	...	5,219	3·7	226
Irish Shorthorns—				
Colleen Bawn (imp.)	42	6,937	3·8	309*
Gibson Girl (imp.) ...	42	9,291	3·5	380
Holsteins—				
Dutch Oven ...	47	8,671	3·6	365
Margosa	31	5,998	3·0	209
Miss Miedenia	38	6,646	3·8	296†
Berchem	58	8,236	3·2	307*†
Jerseys—				
Egypt's Glory	60	6,558	5·8	
Calceolus	56	6,113	5·5	397
Bellona	36	2,267	6·1	163
Isabel	29	2,030	5·5	132†
Maid of Athens	34	3,477	4·6	188
Rum Omelette 2nd...	45	5,109	4·8	289
Culcairn	53	5,600	5·4	357*
Lady Pat	33	3,087	6·5	238†
Golden Omelette	28	3,064	5·6	202
Lally Optician	...	4,077	6·2	299
Queen of the Nile ...	23	2,321	5·0	137†

* Cows not yet dry. † Cows on their first calf period.

TESTING OF PURE-BRED CATTLE.

The United Dairy Cattle Breeders' Association, which was formed last June to represent all breeds of dairy cattle, drafted a herd-testing scheme in conjunction with myself, which has since had the approval of the Minister of Agriculture. Its main features are that the testing will be done by officers of the Department of Agriculture, and a day's record will be kept per month for a lactation period of nine months for each cow. The cost to the breeder is a mere bagatelle compared with what the work will actually cost. A charge of 5s. per cow per year is all that is required from those who are members of an association representing their particular breed, but each breed society pays a contribution to the central association. In those cases, however, where a breed is not represented by a society, such as is the case of Holsteins, and at the present time of Ayrshires, the breeders of these animals will be required to pay an entry fee to the central association of 10s. per herd for the testing of twenty animals or less, and £1 per herd for the testing of more than twenty, in addition to the 5s. per cow stated above. This really places those individual breeders not represented by an association on somewhat better grounds than breeders that are associated, because in every case the annual subscription to an individual breed society is at least 1 guinea.

Practically all the work connected with the herd-testing scheme, including the keeping of records, &c., is carried out by the Dairy Branch of the Department of Agriculture, and the records will be absolutely official and be recognised as authentic throughout the world.

Advantages of the Scheme.

It might be asked why is it that the Government is prepared to go to such lengths towards supporting the testing of pure-bred cows, as compared with the subsidy of 10s. in the £ which the Department pays to individual Herd-testing Associations that are formed mainly for the purpose of testing and keeping the records of ordinary dairy cattle; but when it is borne in mind that the improvement of the cattle of the State can only be brought about by the aid of pure-bred sires descended from first-class dairy cows, it will be seen that the testing of pure-breds is a first call on the energies of the State in this direction.

Let us see what are the advantages, both to the individual breeders of pure-bred stock and to the dairy farmers of the State as a whole. If, for instance, a register were available to-morrow wherein one could see the annual records of all the pure-bred cows in the State, farmers would be able to select young bulls, not only of the lines of blood which they require, but also on that sound basis, the productive capacity of their ancestors. This would mean really that there would be no use in submitting for public sale any bull unless the records of his dam and grand-dams were made public at the same time. The outcome of this would be that no breeder would keep bulls from any cows whose records were below the standard, unless in those unusual cases wherein, though the immediate dam gave a record below the standard, the grand-dams showed records up to standard. It does not require very much imagination to picture how rapid would be our progress under such circumstances; and as our cattle improved so the wealth of our dairy farmers would improve, and hence the general wealth of the State.

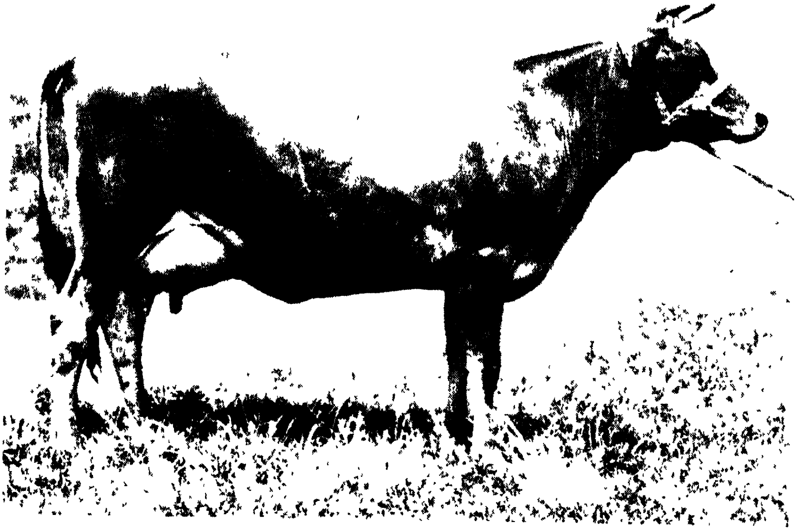
Let us now see how the scheme, if successful, will affect the individual breeder of pure-bred stock. It may be taken for granted, to begin with, that those breeders submitting either males or females for sale whose dams showed the best records, would, if the animals showed good conformation, obtain the highest prices. Thus it would pay a breeder who decided to produce animals of exceptional merit to go to the expense of importing blood from Europe, if necessary, and thereby afford fresh blood to be selected from by our dairy farmers.

Feeding.

There is, however, another aspect to the question which is not generally recognised, namely, that in order to give his animals an opportunity of producing good results, a breeder would take care that sufficient food was conserved to enable the cows to have a proper food ration throughout the entire lactation period. In other words, there would be more money in the business for him, and it would pay him to go to extra trouble in order to do justice to his cattle. The force of this example would be in time reflected on his neighbours, and not only would breeders of pure-bred stock make the necessary provision for obtaining the best results, but the general dairy farmer would be stimulated to follow the example of his neighbour, and pay more attention to the feeding of his cattle than is now the case. As a matter of fact, the dairy farmer would have better cattle, and it would pay him to feed them better. No doubt many of our dairy farmers would have fewer cattle than at present, and there would be less over-stocking in years of plenty, and more reserves put by for the lean years.

I feel sure that when our dairy farmers and breeders generally grasp the advantage of the scheme now made available for the testing of pure bred cattle, it will find general support. Even at the present time those breeders who are having their cattle officially tested will, in a couple of years, be on a very much better footing than the man who has no authentic records to produce. Hence it behoves breeders of any importance to enter into the scheme as soon as possible, for even though the season may not be very favourable just at present, rains may fall at any time, which will alter the condition of things; and the breeder will then be sorry that, through his own neglect, he missed part of the lactation period of some of his best cows.

A number of herds are now being tested under the scheme as drafted, and the animals submitted so far comprise Jerseys, Shorthorns and Guernseys; but it may be stated to the credit of the Jersey breeders that they have come forward in greater numbers than the representatives of any of the other breeds.



Jersey Cow, Lady Pat.
Sire: Sir Jack; Dam: Pattibelle.

Jersey Cow, Lally Optician.
Sire: Sir Jack; Dam: Bellona.

BREEDS OF DAIRY CATTLE.

Ayrshires on Grafton Experiment Farm.

Ayrshire heifers on Grafton Experiment Farm.

Some of the Ayrshire dry cows on Grafton Experiment Farm.

BREEDS OF DAIRY CATTLE.

Hints on Cheesemaking.

HANDLING FAST-WORKING MILK.

MATTHEW WALLACE, Dairy Instructor.

TROUBLE is experienced during the summer months of the year by most cheesemakers on account of the high acid of the milk in the morning. This is particularly felt in dealing with milk which has not been properly cooled directly after being milked. Unfortunately there are many farms where no facilities exist for cooling milk other than allowing it to stand in cans over night, or in the cheese-vat when cheese is made on the farm. Some makers contrive to keep their milk in fairly good condition by putting it in pans on a cool floor.

Cheesemakers are still met with who aver they can make good cheese from fast working milk, but examination of the cheese produced reveals the fact that their standard of excellence is not a very high one, and their statements are discounted by cheesemakers of experience.

By modifying the usual method of manufacture, it is possible to produce a fair cheese, but rarely a first-class one. So far as I am aware no one has yet produced the proverbial silk purse from a sow's ear, and this is very much the position of anyone trying to produce first-class cheese from high acid milk.

On the average it will be found that milk containing 0·23 per cent. acidity will work fast, in some cases very fast indeed. Fast working means an imperfectly cooked curd, and consequently a soft pasty cheese which will not keep well. There is also a considerable loss of fat and casein in the whey. It should be pointed out that in addition to the loss of fat and casein which takes place in the working of a fast cheese, there is a decreased yield, due to the lessened capacity of the casein to hold and retain moisture in the ripened cheese; this in spite of the fact that such cheese is often very soft when put to press. This fact is worthy of more consideration in fixing the standard of acidity above which milk should be rejected for cheesemaking.

In the present state of our knowledge, nothing will keep milk in good condition for cheesemaking so well as cooling immediately after milking, and this is best effected by passing the milk over a cooler. The "cowy" flavour is also got rid of by this means.

Milk cooled to 70° or 75° Fah., as soon as it is milked, will keep better than milk cooled to a lower temperature after it has stood for several hours with the animal heat in it. High temperatures develop acidity and disagreeable flavours, and no subsequent cooling can eliminate the products already formed in the milk.

In the absence of proper cooling facilities, milk should be kept in small quantities. Large quantities should not be kept together overnight, for even if the milk remains sweet the flavour generally suffers. A shallow cooler placed over the vat, or pans placed on the floor, provide easy means for keeping part of the milk overnight. Where milk is being sent to a cheese factory, the cans should not be filled to the top and kept overnight. Occasional stirring prevents the cream from forming, and assists in cooling the milk.

Preservatives are forbidden, and their use in the milk should be discouraged, as it interferes with the action of the rennet and retards coagulation. The aim should be to deliver milk in such a condition that it will be under the control of the cheesemaker.

High acidity is not the only cause of trouble with milk which has not been properly cooled. Such milk will often produce injurious fermentations in the curd, which makes it difficult to handle, and is the cause of considerable loss.

In the treatment of acid milk the principal object is to get ahead of the acidity, and the process is modified to suit the circumstances. A reduced quantity of starter should be used (with very acid milk none at all), and rennet added as soon as all the milk is in the vat, the proper temperature for setting reached, and the colour thoroughly mixed. In such cases, the rennet should be diluted with at least six times its bulk of clean cold water, as strong rennet, used undiluted, is liable to coagulate the milk before proper mixing has been accomplished. It generally happens that coagulation takes place rapidly, and a firm curd fit for cutting is obtained in less than half the usual time. In some cases, it is found advisable to raise the setting temperature a degree or two above normal, and also add more than the usual quantity of rennet.

The use of very high temperatures is not recommended, as the curd is more difficult to keep separate after cutting, and a firm corky cheese may be the result.

When the curd has become sufficiently firm, no time should be lost in cutting, which should be carried out smartly. An extra stroke of the knives should be given in order to produce a more finely cut curd, as this will assist in firming the curd during the process of cooking.

Stirring should be resorted to at once, to keep the particles of curd separate. Heat should be applied gradually, and the desired temperature reached in from 25 to 30 minutes. This is from 10 to 15 minutes sooner than in working a normal curd. Should the acidity, as ascertained by the acidimeter or hot iron test, be developing rapidly, part of the whey should be run off and a quantity of clean water at the same temperature as the contents of the vat added, and stirring continued until the curd is firm enough. The whey should then be got rid of as speedily as possible, and the curd stirred drier on the racks than in the case of a normal working cheese. It is an advantage to pack the curd shallower at this stage, and turn at intervals of from 10 to 15 minutes. A fast curd should not be piled up while cheddaring, as this prevents the free escape of the whey.

It will often be found that the curd has sufficient acid for salting, in about an hour from the time of running off the whey, in which case it should be milled and salted, at the rate of from 2¾ lb. to 3¼ lb. per 100 lb. of curd, the greater quantity being used for a very soft curd. By the time the curd has become sufficiently cool to put to press, a considerable quantity of moisture will have escaped.

Cheese made from fast-working milk should be stored in a cool room and sold in a month or six weeks time. If kept too long or stored in heated rooms, this class of cheese becomes hard and dry and very strong in taste.

CHICKLING VETCH (*Lathyrus sativus*, Linn.)

A Harmful Plant.

A FEW months ago a resident of Mosman gave me for report some specimens of a leguminous plant which he had growing in his garden. Upon examination I found the specimens belonged to *Lathyrus sativus*, Linn., commonly known as the "Chickling Vetch," a native of France, Spain and Italy.

There are several forms of this species, the two most common being the blue-flowered Lathyrus, or Chickling Vetch, figured in the *Botanical Magazine*, t. 115; and a white-flowered form. The specimens from Mosman belong to the latter, were brought over from the United States of America, and are cultivated by at least two people at Mosman. It was the intention of one of them to use it as a fodder.

As this species is reported to be harmful to man and cattle who eat the seeds, I have thought it advisable to draw attention to the fact, and so have warned those who gave me the specimens; and in case there are others who may be growing this plant as a vegetable, it might be advisable to publish the following particulars.

In Lowe's *Manual Flora of Madeira*, p. 211, the following account is given:—

> Such fatal effects were produced in the latter end of the seventeenth and beginning of the eighteenth centuries in some parts of Europe by the use of the seeds of this plant, that the authorities were obliged to interfere and forbid its cultivation.
>
> In Martyn's edition of Miller's Dictionary, the flour prepared from the seeds is said to make a pleasant light bread, which, if half the quantity of wheat flour has been mixed with it, is also perfectly harmless; but when used unmixed, those who have lived on it for some time are seized, it is said, with violent spasmodic attacks of rigidity of the muscles, followed by the total and incurable loss of their limbs; and, it is added, these effects even extend to poultry and cattle (pigeons, swine and horses) fed upon it.

In Watts' *Dictionary of the Economic Products of India*, p. 592 (1890), a rather lengthy account is given of the poisonous property of this plant, and, according to analysis made by Astier, the seeds contain a volatile liquid alkaloid, probably produced by some proteid ferment, which exhibits the toxic effects of the seeds, and the action of which is destroyed by heat. It is further stated by Watt that "in one district of Bengal alone, according to Irving, nearly 4 per cent. of the population suffered from its toxic effects in 1860"

Other particulars concerning the injurious effects of this plant have also been published by Mr. J. H. Maiden in this *Gazette*, vol. xii, p. 655, 1901.—**EDWIN CHEEL**, Botanic Gardens.

Burrawang or Zamia.

(*Macrozamia*, Sp.)

THE Zamia Palm, or Burrawang, or Wild Pineapple, has been found by analysis to contain oxalic acid and an alkaloid principle. The roots, as well as the leaves, have been proved to be poisonous; consequently complete eradication requires that the whole plant should be dug up and removed.

The Burrawang is, therefore, a serious pest. It occurs in various places throughout the coastal districts, mostly on poor scrub lands; it is green throughout the year, and, particularly in times of scarcity of other fodders, cattle eat it. The result is a condition of partial paralysis and loosening of the horns, and sometimes death. The condition is commonly known by the name of "Rickets."

The Chief Inspector of Stock makes the following remarks:—

> Treatment cannot be described as effective. If stock are removed from affected country as soon as symptoms are observed, and put on fairly good feed, they will recover, while if left too long no treatment is likely to be of much avail. Should it be desired to treat, the stock should first be removed from Burrawang country, and each animal given a purgative dose of ½lb. to 1lb. of Epsom salts, according to the size of the animal, with 1oz. of ground ginger. This should be followed by a course of powders made of powdered nux vomica, 2 drachms; potassium iodide, 2 drachms; powdered gentian, 2oz.; given once daily.
>
> These would either have to be given in food or drench; so it can be readily understood that, except with really valuable stock, the time and expense to be devoted to treatment are apt to be more than is considered justifiable. Whatever the treatment adopted, a fairly long period will elapse before recovery is complete.

At the request of the Upper Clarence Progress Association, through the Hon. C. A. Lee, M.L.A., Mr. George Marks, Inspector of Agriculture, visited the Tabulam district in August last, and furnished the following report:—

ZAMIA COUNTRY IN TABULAM DISTRICT.

GEORGE MARKS, Inspector of Agriculture.

In company with several of the settlers of Ewingar Creek, I rode over the ranges at the back for several miles to where the "Zamia" was troublesome. The country is rough and broken, totally unsuitable for agriculture, but very good grazing lands, having a stock-carrying capacity of about 7 or 8 acres to a beast. At the time of my visit the grass was knee-high everywhere and green, but this was due to the fact that on account of the stock being affected with Zamia, these areas were closed against grazing. The Zamia was thickest in the timbered areas, where it was well sheltered from the sun, and particularly in the shady side of the gullies. On lands that were improved, or had been rung for a few years, the Zamia was not so plentiful. Zamia is by no means confined to this particular locality, as I have noticed it on the hill country all along the coast from the Queensland Border to the Hunter.

But, as referring to the locality in question, some thousands of acres had been leased by the owner of Yugilbar Station until a few years ago. Forty years ago a few cattle were occasionally noticed affected in the hind-quarters on the hill country leased, but the trouble was thought to be due to limbs falling from trees and injuring their backs. Beyond the loss of a few animals no serious notice was taken of it. It was not until some twelve or thirteen years ago that the trouble assumed serious proportions, when a herd of 900 stores from Queensland which had been running on "pineapple" country, were taken on to the station. It is considered that not more than 500 of this mob left Yugilbar, the remainder succumbing to Zamia poisoning. Though they had plenty of feed, these Zamia-eaters evidently taught the local stock the habit, and the losses became so heavy each year that the country affected by the Zamia was cut off, and the leases given up. Since some of this leasehold has been taken up in recent years, the trouble has been revived, but the selectors were not fully conversant with the nature and effect of the Zamia until they had suffered considerable losses. In one instance a selector, through this ignorance, took up a selection of almost all Zamia country, for which action he has paid dearly. The selected blocks are mostly 1,280 acres, and run from creek frontages back to the hills. Dairying has been started on several farms, though the principal occupation, of course, is the rearing and fattening of beef cattle. At the head of the Clarence, Zamia is fairly plentiful, but the stock-owners there, in most instances, have gone to some considerable trouble and expense in cutting it out with a mattock, and then burning it after it is dry, with other dead timber that may be felled or rung.

In the Upper Clarence locality the only country available to settlers to enlarge their holdings consists of this Zamia land, and a great deal of it is worth taking in hand. There appears to be only one remedy, and that is to cut it out by the roots and burn it. The bulk of this land is unimproved. Systematic ringbarking will assist in thinning it out. On account of the exceptionally large root development, the plant is able to withstand extremes in climatic conditions, and the practice of some of the settlers in brushing the plants level with the land is practically waste of time and labor.

I should strongly recommend, where possible, fencing off the affected areas, so that stock could get the benefit of the clean land. With the best of the affected areas the timber should be rung to benefit the grass, and also to let the sun in on the Zamia, which prefers shady and sheltered places, and then, as time and opportunity permit, gradually cut out and burn the plants, by using a strong mattock and digging deep, so as to get the whole root out. As soon as additional areas are cleared they may be fenced off and added to the other grazing lands. As the plant does not spread rapidly, it really only requires one operation to complete the work. I have met several graziers in other parts who state that they have adopted this method, and are now free of this pest.

In the case of new selectors who may wish to lease additional areas, some assistance may be afforded by allowing them to have the land on some sort of an improvement lease system for a term of years.

In the very rough, stony country, where the Zamia is very thick and the stock carrying capacity very low, it would probably not pay to go to the trouble and expense of eradicating it. There are considerable areas worth clearing, but under existing conditions the lands are idle and practically worthless.

A DISEASE OF FRENCH BEANS.

IN July, the Hon. John Perry, M.L.A., presented a letter from Mr. C. Ainsworth, of Ballina, calling attention to a disease in the bean crops of the North Coast. The manager of Wollongbar Experiment Farm subsequently collected specimens, which were examined by the Bureau of Microbiology; and the following report, which was furnished at the time, is now placed on record :—

> The disease is known as "Anthracnose" or "Pod Spot," and is due to a fungus, *Colletotrichum lindemuthianum.* It occurs all over the world wherever beans are grown, often as a very serious disease, and attacks pods, stems and leaves, but the most conspicuous injuries are the spots on the pods. The fungus penetrates the affected parts to a considerable extent, and the seeds in the pods beneath the spots are often spotted or discoloured, and the fungus is present in the seed. By the use of such seed the fungus is readily distributed. It may appear upon the cotyledons (seedling leaves) of the young plant when such badly infected seed is sown. The stems of plants are often so badly diseased near the base that they may fall over and die. The pods when quite young and succulent offer the best conditions for the growth and development of the fungus. Spores from diseased spots on stems and leaves may fall on the pods, where in the presence of moisture and a sufficiently high temperature they germinate rapidly and produce the spots. These spots enlarge and darken until nearly black. The dead tissue dries and shrinks. Spores are produced by the fungus in these spots in great abundance, and ooze out, forming pink masses held together by a mucilage which, when dry, sticks them to the spot. When dew or rain falls on these spots, the mucilage is dissolved and the spores set free in the water. At this time, any disturbance of the bean plant will scatter these spores to other plants. For this reason beans should not be cultivated nor handled in the early morning while the dew is still on them, or after a shower. The spores are scattered when wet, and hence a rainy season is most favourable to the spread of the disease.
>
> *Treatment.*—(1) Since diseased pods and stems left in the fields will provide infection for the new crop, all diseased plants, leaves and pods, should be removed and burned.
>
> (2) Only clean seed should be used in any future planting. This should be obtained from some source known to be free from disease. All seeds showing spots or discolorations should be discarded. If these two factors are rigidly carried out the new crop may be free.
>
> (3) A rotation may be very useful, to afford time for spores in the soil, from fallen and decayed plants and pods, to die out. As this fungus attacks cucumbers, watermelons and pumpkins, these should not be used as rotation crops.
>
> (4) Spraying with Bordeaux mixture helps to keep the growing crop clean—5 lb. copper sulphate, 4 to 5 lb. lime, and 50 gallons water. First spraying, when first true leaves are unfolding; second, about ten days to two weeks later; third, when young pods are being formed. Well drench the pods, stems and leaves with the fungicide.

Cauliflower and Cabbage Cultivation.

A. J. PINN, Assistant Inspector of Agriculture.

OWING to the absence of literature dealing with cabbages and cauliflowers and their cultivation, the following has been written as a guide to assist intending growers. The article deals with the growing of these crops in large areas, but certain recommendations can be modified to suit small growers, *e.g.*, plants can be set closer in small garden plots, as all cultivation is carried out by hand, and there is not the same necessity for leaving so much space.

The past year has been a very successful one, good prices having ruled throughout the year. The season experienced in the chief centres of supply, with the exception of the Bathurst district, was all that could be desired. With the ever-increasing population of Sydney and inland towns, it would appear that the cultivation of these crops can yet be extended with every likelihood of profitable returns to the growers. Apart from the metropolitan markets, there are many instances in which cultivation for local requirements could be extended. Even in the most fertile division of the State—*i.e.*, the North Coast—it is common to see large quantities of these vegetables on the boats from Sydney. Also in many of the inland towns, where the conditions are suitable, the quantity grown is not sufficient for requirements. At Goulburn, for instance (which by virtue of its situation should be on a level with the Bathurst district in production), I have seen consignments obtained from as far back as Wagga.

Many people are under the impression that the growing of these vegetables for Sydney market is confined to the Chinese; but such is not the case. In the vicinity of Sydney the market gardens are practically all controlled by Chinese; but in inland districts, where the gardens are not of such a mixed character—where practically only one or two varieties of vegetables are grown—the areas cultivated are chiefly worked by Europeans.

During past years about 1,000 tons have been imported annually from Victoria. The charges for handling and boat freight have increased considerably of late, and the produce is generally not as fresh as it should be when marketed—due to unavoidable delays in delivery—so that there is an excellent opportunity offered for local growers to supply the whole demand. I was informed by a local commission agent, who handles a considerable quantity of Victorian cabbages and cauliflowers, that the expenses attached to shipment from Victoria are equal to the cost of the vegetables in that State.

1. CAULIFLOWERS.

Although belonging to the same family as the cabbage, the cauliflower is not grown to nearly the same extent. This is due chiefly to the necessity for more favorable conditions during the growth of the plant than are required by other members of the brassicaceous order.

Extent of the Industry.

The district in which the greatest area in this State is devoted to cauliflowers is in the vicinity of Bathurst, including Esrom, Orton Park, Perthville, Campbell's River, and White Rock. The extent to which this crop is cultivated may be gauged from the quantity sent away from the Perthville Railway Station. In the year 1910 there were 1,805 tons despatched, and in 1911 the quantity was 1,350 tons. In addition, they are also trucked from Kelso and Bathurst in large quantities.

The crop is also grown fairly extensively in the Hunter River Valley, chiefly in the vicinity of Bolwarra, Louth Park, Oakhampton, Miller's Forest, Raymond Terrace, Nelson's Plains, and Raworth, mainly to supply the Maitland and Newcastle markets.

Good cauliflowers are produced in many other districts, but their cultivation is not so extensive as in the districts named. One of the chief limiting factors in the success of the crop is the need of a quick train service to market. It is essential, if best prices are to be obtained, that the produce should be placed on the market within twenty-four hours of harvesting.

Climate.

It is preferable to grow this crop so that the flowers form in the cool months. The ideal climate is one in which the days are fairly warm and the nights cool, such as is experienced in the tableland districts.

The Soil.

The soils most suitable for their cultivation are alluvial flats that are fairly rich in organic matter, due to periodical flood deposits. These soils are usually fairly loose in texture, and, being situated on the banks of rivers and creeks, are generally well drained. As a rule the rental value of land of this character ranges from £2 to £4 per acre.

Preparation of the Soil.

The land should be well prepared, and this is best effected by working a rotation on the farm. A crop such as early potatoes could be harvested in time to allow of cauliflowers being planted out. Again, the cultivation during the growth of potatoes reduces the soil to a suitable tilth, and renders it free from weeds. By employing such a rotation, the land is in use during the spring and early summer months. On account of the risk of reducing the amount of available moisture in the soil by the growing of a crop during the spring months, the practice is not recommended in districts where irrigation cannot be carried out and the rainfall is scanty. If it is desired to bare-fallow the land before planting, the soil should be ploughed in spring and cultivated during the summer months to kill weeds and conserve moisture. If it is intended to supply farmyard manure, this should be ploughed under when the spring ploughing is carried out.

Seed.

Good seed is of the utmost importance, and most growers are fully aware of this fact. The Chinese growers are very particular in selecting the most suitable strain of seed, very few of them, during the past season, paying less than £3 per lb. for their seed, whereas the bulk of the Europeans are paying about 12s. per lb.

Bad seed is dear at any price, because, no matter what attention is paid to the crop during growth, there will always be a large proportion of useless plants.

The members of the Cauliflower Association of Long Island (United States of America) placed so much importance on the selection of seed that they sent a representative to Denmark to select a crop from which seed was saved and purchased for the Association. The price charged for seed by the Association at the present time is £3 6s. 8d. per lb.

Good seed should give a 90 per cent. germination, and should not be kept for more than three years after harvesting. As there is little difference between one and two-year-old seed, it is advisable for the grower to buy his supply of seed one year in advance. This allows of a small portion being planted, so that its relative value may be gauged one year in advance.

Raising the Plants.

Make the seed-beds where they will be constantly under observation, and where every care can be bestowed upon them. The beds should be wire-netted, as it does not take long for a rabbit or fowls to cause almost irreparable damage.

The beds should not be too wide; they should allow of half being weeded from each side. A suitable width would be about 4 feet. A bed large enough to produce plants for one acre when seed is broadcasted would be 20 feet long and 4 feet wide. It is always advisable to put in sufficient seed to raise more plants than are actually needed. This allows for loss by pests, faulty germination, and the transplanting of healthy plants only.

Two or three ounces of seed is more than sufficient to supply plants for one acre.

The best method of raising plants is to sow the seed in drills in the seed-bed, allowing about 4 inches between the rows. Plants raised in this manner are usually sturdy, and differ from the lanky plants obtained from beds where the seed has been broadcasted. The seed should be sown thinly, and each ounce of seed should sow a length of about 200 feet.

Another method sometimes adopted is to sow the seed broadcast in boxes, and when the young plants have two good leaves on they are pricked out and planted into other seed-boxes in rows about 1 inch apart, where they are left until they obtain their fourth leaf. After this the plants are transplanted into rows 4 inches apart in the beds, remaining there until ready for transplanting, being then about 4 or 6 inches high. This method is more often employed for cabbage when seed is raised during the winter months.

It is advisable to protect the seed-boxes during frosty nights by screening with hessian. The seed-beds should have a north-easterly aspect, and should be protected from the westerly winds.

The young plants should be watered occasionally in the seed-bed, but should not be forced so as to make them spindly.

Where water cannot be given to the seed-beds by soakage, or where there are no facilities for spraying, a satisfactory method to adopt is that employed by the Chinese, viz., to use a vessel attached to a long handle, for distributing water evenly and lightly over the beds. This method of watering is of use where the seed-beds are made alongside a running stream or irrigation canal. By using this appliance a great deal of labour is saved that would be necessary if the watering were done by means of a watering-can.

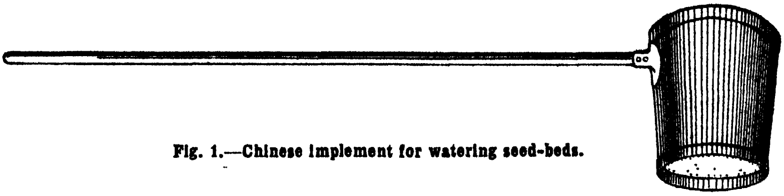


Fig. 1.—Chinese implement for watering seed-beds.

The soil in the seed-bed should be of good texture, and, if possible, a quantity of well-rotted farmyard manure should be incorporated. The organic matter supplied by the manure regulates the water-holding capacity, and also offers less resistance to the tender roots in their development. After the seed has been sown, it is advisable to scatter dry, finely pulverised manure lightly over the surface of the bed. This acts as a mulch, and prevents caking of the surface soil, thus offering no resistance to the young plants when germinating.

Time of Sowing.

In small gardens, cauliflowers can be grown over a longer season than is possible on large areas. The small gardeners are prepared to take risks that it is not advisable for larger growers to take.

For main crop sowings, the plants are put out from the end of December to the end of February, the seed being sown about six weeks prior to the time of transplanting.

Transplanting.

If possible, a dull day should be chosen, but with a large area it is impossible to choose so carefully. If the weather is very hot and the planting cannot be postponed, it should be done during the latter part of the afternoon. When this is the case part of the morning can be employed in lifting the plants in readiness for afternoon planting. The plants when lifted should be laid straight and covered with wet bags.

Unless the soil is very dusty and hot, the dibber holes are better left dry until after planting, but the roots should be covered with puddle (liquid mud) to prevent injury. After the soil has been pressed firmly round the roots, a quantity of water should be applied in order to give the plants a fair start.

The quickest method of planting by hand is to have a boy dropping the plants a few holes ahead of the man planting. The boy can then carry the plants in a bucket, so that the roots are constantly in puddle.

If the plants are somewhat large, it is wise to screw the tops off the leaves. This considerably reduces transpiration, and the roots are able to keep up the supply of moisture needed.

In America, planting machines have been tried extensively of late, but the bulk of the growers have again fallen back to hand-planting, as they consider this method, although slower, gives more reliable and better results. One of these machines is to be used in the Moss Vale district this season. It is known as the "Bemis Transplanter" (Fig. 2). The machine requires

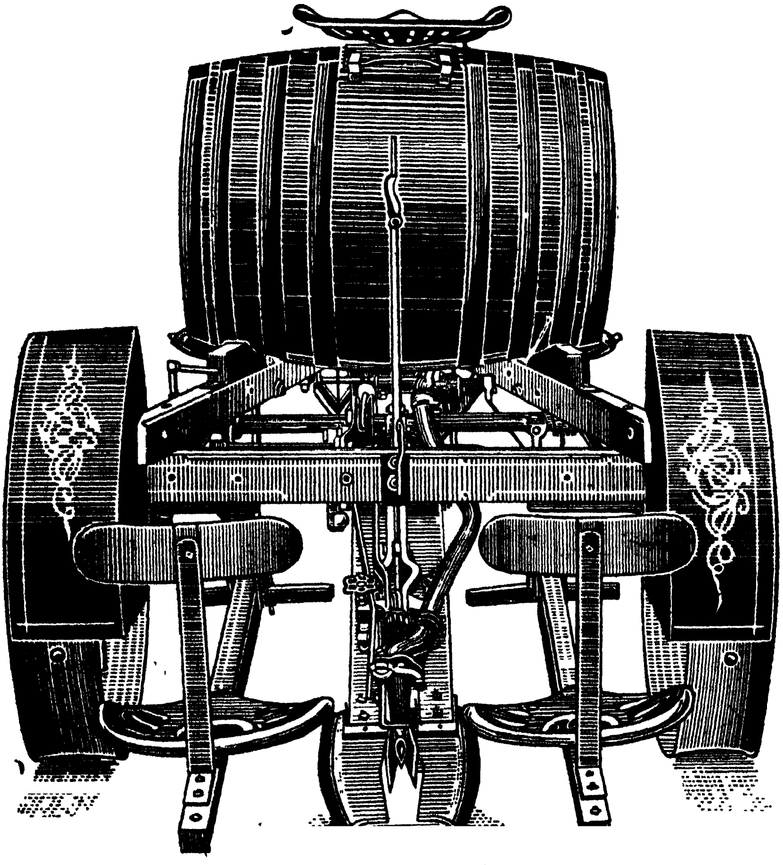


Fig. 2.—The Bemis Transplanter.

a driver and two lads to drop plants. A barrel of water is carried, and at each click which marks the time for dropping a plant, about half a pint of water is delivered into the furrow. As the lads cannot always drop the plants just at the right moment, the water is usually allowed to run all the time.

Distance of Planting.

For early varieties the planting is usually closer than for the later varieties. For the former the distance is usually 3 feet x 2 feet 6 inches, requiring about 5,800 plants per acre, and for the latter 3 feet x 3 feet, requiring 4,840 plants per acre.

Manuring.

It is essential that soils for this crop should be well supplied with organic matter. Unless frequent applications of organic manures are made, the supply of this constituent is soon depleted, and the grower wonders why his soil does not produce profitable crops. The tendency of European growers is to grow these crops until the natural fertility of the soil has been considerably reduced, and then abandon cauliflower cultivation.

Most of the river flats are rich enough to grow several crops without the application of farmyard manure, and where the land is subject to periodical floods and benefits by flood deposit, there is scarcely any need for heavy manuring. The Chinese growers are constantly enriching their soils by the application of farmyard manure.

The following extract is taken from the Cornell University Agricultural Experiment Station's Bulletin, No. 292, being a treatise on cauliflower-growing on Long Island, where the area under crop approaches 3,000 acres:—

> The cost of horse manure is $1·50 to $1·65 a ton (over 6s.), f.o.r. buyer's station. . . A car of manure weighs anywhere from 25 to 35 tons, and most of a carload is required to dress an acre—say from 20 to 25 tons.

Surely if this money can be expended where the price of the produce is considerably lower than in New South Wales, the local growers would do well to follow the practice.

In addition to stable manure, the use of commercial fertilisers is universally adopted. The following is taken from Farmers' Bulletin No. 17, and is the recommendation of this Department:—

MANURES FOR CABBAGE AND CAULIFLOWERS.

These plants make heavy demands upon the plant food in the soil, and require very liberal manuring. The increased production obtained by manuring is, however, of considerably greater money value than the cost of manuring here recommended, which may at first sight appear rather high.

A.	Quantity per half-ton.	Cost. £	s.	d.
Bone-dust ...	9 cwt.	2	14	0
Sulphate of potash...	1 cwt.	0	13	6
	10 cwt.	£3	7	6

Apply the above at the rate of 3 cwt. per acre when sowing or planting out.

This will give a dressing of—

12 lb. nitrogen
60½ lb. phosphoric acid } per acre.
17½ lb. potash

The nitrogen and phosphoric acid in the above are in slowly available forms, and should be supplemented by a top-dressing (just before the heads begin to form) of—

B.

½ cwt. sulphate of ammonia
¾ cwt. superphosphate } per acre.
½ cwt. sulphate of potash

This dressing will cost 17s. per acre, and there will have been given a total dressing of—

23 lb. nitrogen
74 lb. phosphoric acid } per acre.
47 lb. potash

The total cost of the above applications would be £1 17s. 3d. per acre.

Cultivation.

Cultivation between the rows with horse cultivator should be continued at short intervals, until the plants are too big to allow of it being carried on. If plants are not planted on the check system, and do not allow of cross cultivation, chipping-hoes will have to be used to keep down weeds, and establish the earth mulch between the plants.

Tying.

This is the practice of tying the outside leaves over the plant to protect the flower from weather influences. The system has its drawbacks, and is seldom adopted in this State. The chief difficulty in adopting this method is the trouble of determining whether the plants are ready to harvest. Some growers use a different coloured band each day, so that when examining for fitness for market they can pick out the mature heads by the various coloured bands. This method is a satisfactory one, if the development of the heads is even.

It is very important that the flower should be kept clean and white. While the head is small, it is well protected by the young leaves surrounding it, but when the coral head begins to grow rapidly, it must be covered in some manner to protect it from sun and frost. This is usually accomplished by breaking off some of the largest outside leaves, and placing them amongst the other leaves so as to properly cover the head, or it may be done by bending over some of the larger inner leaves.

Harvesting.

As soon as any of the plants become fit for harvesting, examination of the field must be made daily, and heads must be cut before they show signs of the flower stalks breaking away, thus giving the head an uneven, loose appearance.

The cutting is usually done with a large knife, the plants being cut about 3 inches below the head, keeping all but the outside, dirty leaves to avoid damage in transit. The plants, when cut, may be carried to convenient heaps round the field; or, if the wagon or cart can be taken through the crop without damaging the growing plants, they may be loaded direct.

The weight of cauliflowers, as marketed, varies with the size, ranging from fifteen to twenty dozen per ton.

Yield.

The yield varies considerably, according to the season and the variety grown. When good seed has been used, and irrigation has been practised, the yield from main crops can be reckoned at about 400 dozen per acre. This allows of very few misses, but this yield is frequently obtained under the above conditions, even when planted 3 feet x 3 feet apart.

Returns.

With cauliflowers selling at from 3s. to 3s. 6d. per dozen, a yield of 400 dozen per acre would give a gross return of from £60 to £70 per acre. This return should allow of a substantial profit being made after paying all expenses.

The prices taken for the purpose of showing the probable return are the average prices obtained for medium grade. Prime cauliflowers would average at least 5s. per dozen, while the small ones would not bring more than 1s. 6d. per dozen. This latter grade is often sold to the local pickle factories.

Care should be taken not to plant a greater area than can be properly attended to. By attempting too much, many a grower has failed. The area to be worked per man should not exceed three or four acres.

Cartage.

The cost of transport by road can usually be estimated at 1s. per ton per mile.

Varieties.

Veitch's Autumn Giant is, undoubtedly, the chief variety grown. It is a late variety, with long stem and large undulating dark leaves. The head is large, very white, and well covered by inner leaves.

Dwarf Erfurt (also known as Early Erfurt or White Queen) is an early variety, and is practically the only variety grown by the Long Island (U.S.A.) growers.

It is a plant of medium size, producing a fairly large, solid, heavy head of good shape.

Snowball.—This variety is a good early sort, and is much favoured in the Goulburn district. It is a little earlier than Dwarf Erfurt, but not equal to it in quality.

Early London.—A fairly early variety, grown largely in the metropolitan gardens.

Broccoli greatly resembles cauliflower, and should receive the same treatment. It takes longer to mature.

2. CABBAGES.

The cultivation of this crop is practically identical with that of cauliflowers, and it will only be necessary in this portion of the article to deal with any points of difference.

Districts.

The largest cabbage-producing district in this State is undoubtedly Burrawang, situated about 9 miles east from Moss Vale, and in the surrounding localities, including Wilde's Meadow, Myra Vale, &c., and extending to Robertson and Kangaloon. About 300 tons are consigned from Moss Vale station every month during the season, and large quantities are also sent out of this district from Bowral.

Large areas are also grown in the suburban gardens, as well as at Gosford and in the Maitland district.

This crop can be grown in practically every district in the State. Nearly any soil will grow cabbage successfully if sufficient manure and decaying vegetable matter are added to keep it in good physical and chemical condition.

As a rule, in the Burrawang district, the rich volcanic soils are chiefly used for the winter crop, and the lower land for the summer crop.

This vegetable has, perhaps, a wider range than any other, being more or less successfully grown in the hot interior, and on the cool tablelands. It is essentially a cool climate plant, and when grown in the hot districts must be planted so as to mature before the heat of summer.

Raising Plants.

In some portions of the State, and chiefly during the winter months, cabbage plants are raised from seed in hot-beds, and gradually hardened off before planting. As with cauliflowers, the seed should be sown six weeks before the plants are required in warm weather; but during the cooler part of the year two months should be allowed.

Distance of Planting.

The distance varies according to the variety used. For the smaller varieties, such as St. John's Day, 2 feet 6 inches x 2 feet is sufficient, and for larger sorts, as Savoy and Succession, 3 feet x 2 feet. If the soil is of poor quality the plants should be given more room, and should be planted 3 feet x 3 feet. When planted at this latter distance on rich soils, the tendency is for the plants to become too large.

Harvesting.

The time to harvest is when the heart is fully developed, and does not yield to pressure from the hand.

Yield.

Cabbages being planted closer than cauliflowers, the yield is, consequently, larger in number of heads, and a yield of from 500 to 600 dozen can be expected in average years. The average price is about 2s. per dozen.

Varieties.

Succession (*Henderson's*).—This is a very popular variety, and the one most largely grown. It is fairly early, has large flat heads, closely packed, carries well, and is a favourite on the market. It stands the heat of summer fairly well, and does not run to seed quickly. The best all-round variety grown.

St. John's Day.—This is one of the best for hot climates. It is very early, and produces a firm heart. A small cabbage.

Improved St. John's Day.—This is the best of summer cabbages, and altogether distinct from the small St. John's Day, being somewhat later and larger.

Savoy.—This is a very crinkled type of cabbage, having a very dark green colour and a distinct flavour. It is especially suitable for the cooler portions of the State, being planted in February so as to mature during autumn and winter, the flavour being considered best after exposure to frost.

London Market.—This is a good main crop variety for autumn planting.

Early Jersey Wakefield.—An early sort, and largely grown in small gardens. It has a very pointed heart, and should be cut as soon as ready for use, otherwise it will run to seed.

Pickling Cabbage.

The cultivation of this class of cabbage is identical with that for the other varieties. Most of these are red in colour.

FUNGUS DISEASES.

Black Rot of Cabbage. [*Pseudomonas campestris* (*Pammel*), EDW. SMITH.]

This disease also attacks cauliflowers and other members of the cruciferous family.

Infection takes place through wounds, or through the pores on the edges of the leaves. The area affected becomes dry. If the stem of a leaf or a stalk of a diseased plant be cut across, a brown or black ring will be plainly seen, this being the best means of identifying the disease.

It is only in very moist seasons, and when the weather is warm, that the disease develops into an epidemic, and causes the destruction of the bulk of the crop. In ordinary seasons plants affected within a month after transplanting may live to produce heads, and good yields may be obtained from a field where almost every plant is affected. The rapidity of the progression and ultimate damage to the crop depend almost solely on weather conditions.

Where plants are diseased and ready for harvest, no time should be lost in harvesting them, as they do not keep.

Unfortunately there is no certain method of controlling the fungus, the only method being that of prevention.

It has now been proved that the fungus causing this disease lives on seed for a considerable period, and may easily be transferred by this medium to clean areas. It is therefore advisable to dip the seed in a 1-320 solution of formalin for 20 minutes just prior to sowing. This treatment does not interfere with the germination.

Manure that has come from animals that have eaten diseased plants should not be used in seed-beds, or upon the field where the crop is to be grown.

A rotation of crops should be practised, so that no crop of the same family is grown on the same land more than once in three years.

Club-root (*Plasmodiophora brassicæ.*)

This disease is known under many names, the chief of which are "Club-root," "Finger and Toes" and "Club-foot."

The affected plants have a wilted appearance during the day, but recover at night. The diseased plants seldom grow to maturity.

The disease is found to be worst on clay soils that are deficient in lime. The presence of sorrel indicates a soil in which the disease is likely to develop rapidly. It might also be mentioned that acid manures, such as superphosphate, encourage the disease.

The cause is a slime fungus, and the disease is described fully in the *Agricultural Gazette* (vol. v, page 553), from which the following has been extracted:—

> When a section of an infected root is examined under the microscope, it will be found that the larger cells are filled with a slimy substance. These are infested with the slime mould, and, on account of the presence of this parasite, the cells undergo remarkable enlargement, and an influence is communicated to the outer neighbouring cells, so that the roots become much swollen and distorted. This fungus obtains entrance to the cells of the growing root, and there robs the infested tissue of its vital fluids, and, gathering new forces in itself, fills the cells with its own substance. This semi-fluid material then begins the process of spore formation, which results in the production of millions of minute bodies, each of which is capable of a new growth, when conditions are favourable. By the decay of the roots, which takes place rapidly, and with much offensive odour, the spores are set free in the soil. These spores there germinate by producing moving bodies capable of penetrating, or being absorbed by the thin walls of the hair and other superficial cells of the root. The soil becomes diseased in the sense that the germs formed in the swellings, and other distortions of the roots, are set free, and the earth holds them for an indefinite length of time.

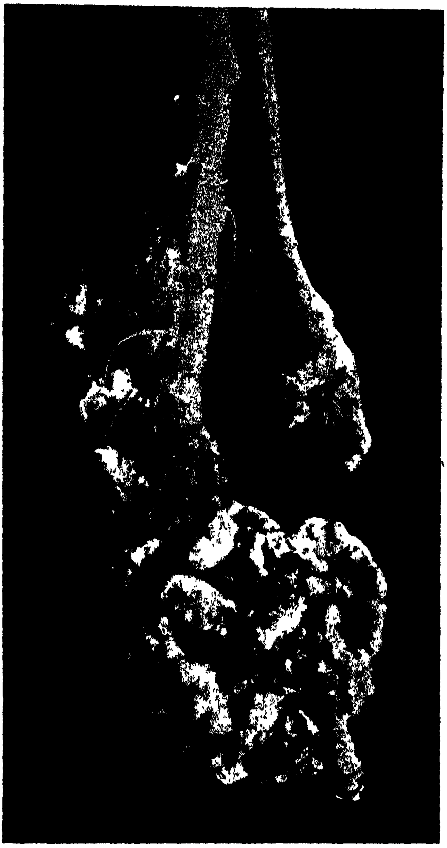


Fig. 8.—Club-root of Cabbage.
(*Plasmodiophora brassicæ.*)
Photo by Bureau of Microbiology.

Precautions and Treatment.

From a consideration of the nature of the Club-root fungus, and a knowledge of the different kinds of plants infested by it, there may be some suggestions gathered as to preventive measures. When it is understood that the "Club-root," and all the injury to the crop accompanying it are due to an internal subterranean parasite, it becomes evident that no treatment to which the infested plant may be subjected can give promise of a cure. Preventive measures must be relied upon, and, in the first place, all the refuse of a cabbage, turnip, or other infested crop should be removed from the soil and burned. In view of the fact that the soil may become more or less impregnated with the germs during the growth of a crop susceptible to the disease, it is evident that a wise precaution consists in a judicious rotation of crops. Just what that rotation should be is a question for each grower to decide for himself, but, for the best results, cabbages or any allied crop should not be upon the soil oftener than once in three years. Cabbage, kale, rape, turnips, or radishes should not follow each other if "Club-root" is prevalent.

It is possible to get relief by the use of lime, and, by its constant use, at the rate of 75 bushels (2 tons) or so per acre each year, cabbages have been grown at frequent intervals—almost yearly, upon the same soil. It is likely that a soil naturally abounding in lime may be the best suited for cruciferous crops so far as "Club-root" is concerned.

Seedlings should be examined carefully and, if they show signs of "Club-root,' consigned to the fire.

INSECT PESTS.

The Diamond-backed Cabbage Moth.

(*Plutella cruciferarum*, Zeller.)

WALTER W. FROGGATT, F.L.S., Government Entomologist.

UNDER the name of "cabbage grub" or "cabbage worm," the caterpillar of this little moth, once a European turnip pest, but now world-wide in its range, is well known to Australian cabbage-growers, and also to the cabbage consumer when he finds the little green worms among the leaves of this useful vegetable. It has been known from a very early date among the English farmers, where it is more a turnip pest; but it attacks both turnips and cabbages when grown under the same conditions.

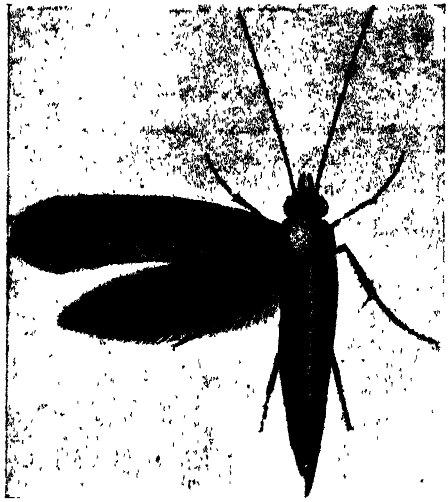
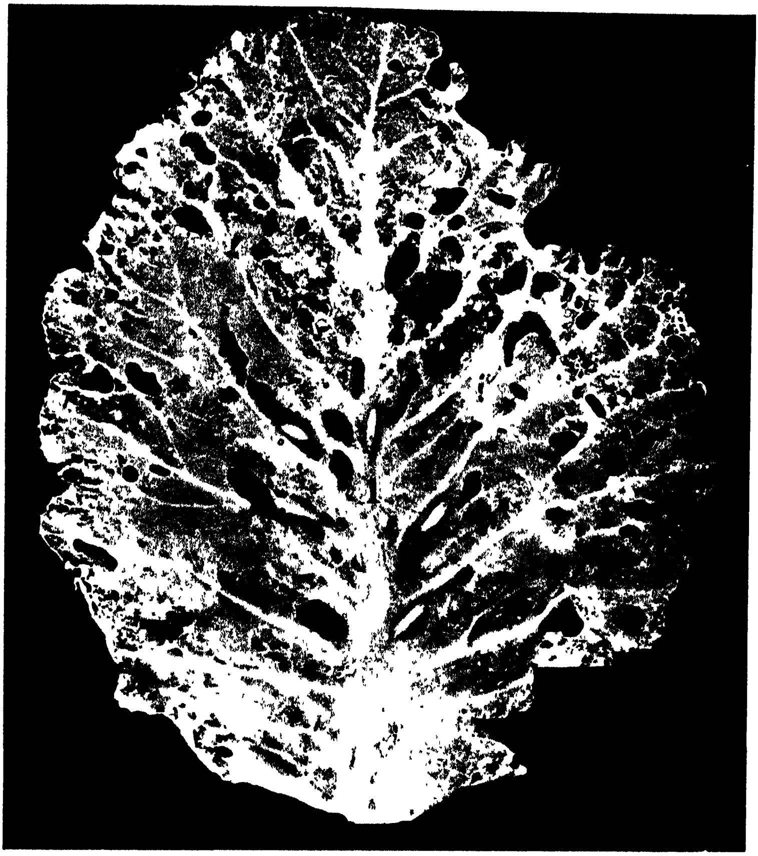


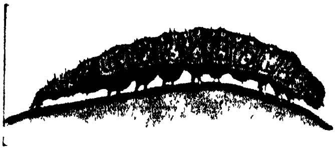
Fig 4.—Diamond-backed Cabbage Moth, viewed from above. (Enlarged.)

It was probably introduced into Australia from England, though it may have come *via* Mauritius, where it was a well known pest, and with which island there was a good deal of direct trade in early days. It was identified by Mr. Meyrick from descriptions furnished in 1883 by the late Sir William Macleay, who stated that it was common in many parts of Australia, and had been for some years previously, particularly about Adelaide. It feeds upon all kinds of plants belonging to the family *Cruciferæ*, such as the turnip, cabbage, cauliflower, mustard, cress and charlock and a number of similar weeds often found about neglected gardens.

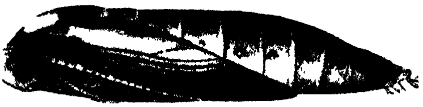
The life-history of the Diamond-backed Cabbage Moth is so well known that it need only be briefly outlined in these pages. The moth, on the wing among



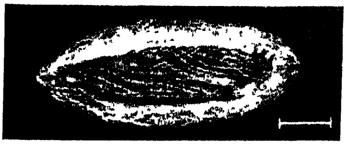
Leaf of Cabbage showing damage caused by Caterpillars of Cabbage Moth, with larvæ and cocoons on the leaf. [Reduced.]



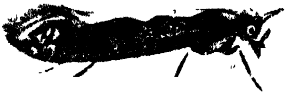
Caterpillar. [Enlarged.]



Pupa (chrysalid) removed from cocoon. [Enlarged.]



Cocoon enclosing the pupa. [Enlarged.]



Cabbage Moth, side view. [Enlarged.]

The Diamond-backed Cabbage Moth (*Plutella cruciferarum*, Zeller).

the herbage, appears to be of a uniform brown tint, and does not show the distinct angular row of pale markings along the upper margin of the folded wings from which it takes its popular name, "diamond-backed," and by which it can be so easily identified among pinned specimens from all other allied species. It measures slightly over half an inch across the outspread wings. Emerging from the stout chrysalid skins, which, attached to bits of cabbage leaves, stalks or weeds, have protected them, under shelter of their flimsy cocoons, through the winter months, these active little moths lay their eggs upon the foliage of the young cabbage plants, and remain in hiding among the weeds and on the under side of the cabbage leaves. As soon as the fine weather sets in, if one walks through a cabbage patch, and sees numbers of small brown moths rising up before him, he will, even if the plants have not begun to show its effects, know that the cabbage moth is about. If he investigates the plants, he will find the leaves marked with glassy spots where the tiny, black-headed, pale green caterpillars have been at work. So like the surface of the leaf are these caterpillars in coloration that they would be easily passed over, if it were not for their gnawing off the epidermis of the leaf.

As they increase in size, they become slender, bright green caterpillars (popularly known as "cabbage worms"), resting upon the surface of the leaves and gnawing holes right through them. At first confining their attention to the larger outer leaves, as they increase in numbers they gnaw all through the cabbage, and if they are allowed to reach this stage the cabbages and cauliflowers are soon of no marketable value. The caterpillars are active little creatures, and if touched they roll away or drop from the leaf to the ground, often hanging suspended on a silken thread, and thus they escape their many enemies. When full grown, they betake themselves to the shelter of the under side of the leaf upon which they have been feeding, and spin a lattice-like, elongate, oval cocoon, or rather hammock, of silken strands, securely attached to the leaf, but open at both ends. It is such a flimsy, delicate structure that one can observe the transformation of the insect. At first a green pupa, it changes to dull brown, and finally reveals all the delicate outlines of the coming moth, enclosed in the pupal skin.

To the grower, the length of time occupied in the development of the moth from the egg, unlike that of the codling moth, is not of much economic importance in Australia, because we have almost a continuous brood of these moths and their caterpillars, cabbages being grown in many districts all the year round. Though economic entomologists have carried out many observations in the time taken in their development, the results have been very variable. In England the caterpillars are said to feed for nearly a month, and the pupæ remained in the chrysalid state from ten to seventeen days. In Australia, in the early summer, the eggs in suitable situations will hatch within a couple of days; the caterpillar state does not last over a fortnight; and the pupal state a week; but all this is regulated by the climatic conditions, warmth and cold accelerating or retarding their development, as with other insects.

It might be here noted that while cold and even frost have little or no effect in destroying insect life, yet heavy continuous rain and wind storms do an immense amount of good by destroying insect pests, particularly those that infest field crops exposed to the fury of the storms and rain.

Such insects as the Diamond-backed Cabbage Moth form a large portion of the food of our small field birds, such as robins, fly-catchers, wrens, white eyes, ground larks, wood swallows and many others; which birds—when the younger generation have learnt to appreciate them for the good they do in destroying pests, if not for their beauty—will be just as carefully protected from harm as they are now carelessly destroyed.

Our cabbage and cauliflower growers in many districts, with few breaks, grow these vegetables all through the year, the young plants being often set out alongside those ready for cutting, or upon the abandoned patches from which the marketable vegetables have been cut; for there is no real winter in many parts of the State. Thus, with a continuous crop, the cabbage moth can breed all the year round, even if there are no cruciferous weeds growing in the gardens, such as wild charlock or mustard weed, upon which they flourish. This is one of the reasons why the cabbage moth is such a serious pest in New South Wales.

Many of our growers are not careful enough in seeing that the young cabbage plants which they buy in bundles from dealers, or from each other, are perfectly free of moth grubs. Anyone going around the Sydney shops (when, as at this time of the year, the suburban resident is busy planting his kitchen garden, and there is a brisk demand for cabbage plants) will see plants for sale with leaves riddled with holes caused by the cabbage moth, and with grubs and eggs still upon them. Yet the ordinary man takes these home, and plants them out without any precautions, such as dipping them in tobacco and soap wash or other mixture; and then later on he will wonder why they are grubby.

The regular market gardeners, or farmers and orchardists who combine both industries, either grow their own plants in seed-beds, or buy them from the Chinamen (when they will sell them); but I have seen them, in the white man's seed-bed as well as in the Chinese garden, badly infested with moth grubs. Unless the young growing plants in the seed-bed are treated until the time of planting out, they soon attract the moths from old cabbage patches. If all cabbage plants were carefully clipped and washed before they were planted out, they would have a fair start in life, without any aphis, cabbage moth, or other pests infesting them.

Then again, our cabbage and cauliflowers are grown in open fields, like the turnips on English farms; and as soon as the cabbages are ready, all the marketable ones are cut and bagged; while all the unsaleable ones are left on the ground, to rot or run to seed, and remain until the owner wants the ground for something else, which may not be for months. This neglected plot is the breeding-ground for the cabbage moth and all other cabbage diseases, insect and fungus.

REMEDIES AND PREVENTIVES.

There have been no lack of remedies suggested and advocated by the different writers upon the cabbage moth; but the greater number, though more or less successful in a small garden, are not practicable when dealing with market gardens or farmers' crops.

Boiling Water.—There is no question that the application of boiling water will kill all the grubs with which it comes in contact, without doing any serious damage to healthy plants. It is applied with a watering-can with a fine rose, the operator walking down between the rows and giving each infested cabbage or cauliflower a good sprinkle. This is very handy for a small garden patch, but in a large field the difficulty is to keep a large quantity of water at the proper temperature, and to distribute it over a large area.

Kerosene Emulsion.—In the United States, the cabbage-growers chiefly depend on kerosene emulsion, and keep the young plants clean until they begin to heart, when they consider the danger is over. This preventive is also used in this State. A large grower, an up-to-date Chinese gardener, told me that he used nothing else on his cabbages, and that where the moth was plentiful he gave them regular sprayings until the plants got ahead of the pest. The spray can be made much weaker for cabbage moth than for scale insects, and the grower will soon find the minimum quantity of oil and soap which will kill the grubs. The main thing is to mix the soap and oil well with the water.

Dry Spraying Lime and Tobacco Dust.—This is a very effective remedy, used by a large number of the Gosford market-gardeners, and first used by Mr. W. C. Dening, of Erina, who is one of the largest growers in the district. I am indebted to his son, Mr. G. Dening, for the following information:—

> It consists of one kerosene-tinful of tobacco dust with four tins of fresh-slacked lime, thoroughly mixed and applied as a dust. He uses it as soon as the cabbages are well established, and says he can dust 1,000 cabbages in an hour, but it must be used while the leaves are wet with the dew. Four tins of tobacco dust and sixteen tins of lime will dust 8,000 cabbages. This mixture remains about the plant for a long time after the application, and is death to all insects that feed upon the surface of the leaves.

As before noted, the main thing is to start with clean cabbage plants in clean ground, and keep the ground clean; and after the crop is marketed clean up the cabbage patch. Then, whatever remedies one uses will have their full effect upon the pest, and the reinfestation will be less. If, on the other hand, the land all round the cabbages is full of infested material and weeds, the grower will have to be going all the time, or he will lose a large percentage of the crop.

Cabbage Aphis. (*Aphis brassicæ*, Linn.)

[From notes by W. W. Froggatt and W. B. Gurney].

This insect is one of the worst with which the growers have to contend. They breed very quickly, and the insects live on the juices of the plant. This is one of the garden pests that gives most trouble in a dry season when the plants are stunted and not growing.

The young, when first hatched, are yellow; in the second, wingless, stage, dull olive-green, covered with a mealy bloom; when full-grown, of a greyish-green tint, with the eyes, legs, spots on either side of the body and tips of the antennæ black; the winged forms are of a much lighter green colour.

REMEDIES AND TREATMENT.

Spraying with tobacco and soap wash early in the season, when the plants show the first signs of its attack, is recommended; also dusting with soot or lime early in the season.

Spray with kerosene emulsion.

Formula.—Hard soap ½lb., kerosene 2 gallons, boiling water 1 gallon. Dilute or dissolve in 22 gallons of water.

Dissolve ½lb. of hard soap in 1 gallon of boiling water, after which the vessel is removed from the neighbourhood of the fire, the kerosene is added and the two churned for ten minutes. One essential condition of success in making this emulsion is that the liquids should be as warm as possible. It is also necessary that the water be as soft as possible.

In preparing this compound, the main trouble is in getting a true emulsion which can only be done by thorough agitation. This is best done by pumping the mixture into itself for some minutes. When this creamy mixture becomes cold, it gets thick and almost solid, and there should be no trace of free oil on the surface.

If there is still unemulsified oil, the best plan is to add some more boiling soap solution and pump again.

Free oil destroys the foliage. Care should be taken to use the best kerosene and good soap.

Kerosene being highly inflammable, pay particular attention to the directions for mixing well away from the fire. Boil the soap and water in one vessel and carry it away from the fire before mixing with the kerosene. Any kind of vessel may be used.

Kerosene attacks india rubber; consequently the tubing, and indeed the whole spraying outfit, must be well washed with hot water directly after use.

Sometimes it is of advantage to prepare a quantity of emulsion as a stock, for use as required. When this is done and it is required to dilute it to make up a spray, this should be done by adding boiling water to it, and not by melting it over the fire, which is dangerous, especially indoors.

Cutworms.

These are the caterpillars of noctuid moths. They feed at night or dusk, or on cloudy days, and will attack grass crops, vegetables and garden plants.

REMEDIES.

When in the crops, the most effective method is destroying with poisoned bran or pollard.

Formula.—1 lb. Paris Green, 16 lb. bran or pollard.

Mix dry in quantity. Add water, and make a mash which will readily crumble in the hand. A little salt or some molasses added makes this more attractive to the caterpillars. Pellets of this mash should then be spread broadcast in the crop where the cutworms are, and they feed on it at night and are poisoned in numbers.

Rutherglen Bug. (*Nysius vinitor.*)

A tiny, oval, dark-grey bug, with transparent wings folded over the back. It is suggestive of a small narrow fly, but has a slender sucking beak attached to the head and projecting horizontally beneath the body. In the warm part of the day they are very active, running quickly and taking to their wings readily at the slightest disturbance.

These insects live on almost all classes of crops and vegetables, eating the sap of the plants.

REMEDIES.

Preventive methods are recommended, such as burning off stubble or waste grass at the edge of crops, to destroy eggs and hibernating bugs.

PUMPKIN BEETLE.

THE most effective means of controlling this pest is to dust the plants early in the morning, whilst the dew is on the foliage, with a mixture of 1 lb. of tobacco-dust to 4 lb. of fine lime. Some growers claim that spraying with arsenate of lead is very effective, but the Department's experience has been that caterpillars are much more easily killed by stomach poisons than beetles of all kinds. In cases where the beetles are very numerous, it frequently happens that they eat up all the foliage before the poison takes effect. Tobacco-dust may be obtained from Sydney nurserymen at about 5 lb. for 1s. Large quantities may be procured direct from the tobacco merchants — W. W. FROGGATT.

SCALDING POULTRY FEED.

A NUMBER of inquiries are being received by the Poultry Expert of the Department as to whether bran, pollard and other cereal foods are benefited by being scalded for poultry food. Mr. F. B. Guthrie, Chemist of the Department, reports:—

> The cellulose is softened and partially hydrolised by heating, rendering it more digestible. Any starch present in the foods is also rendered more readily digestible, the effect of scalding being to cause the starch grains to swell and gelatinise, rupturing the cellulose envelope.
>
> Scalding increases the digestibility and also the palatability of such foods.

The Rain Gauge.

CHAS. J. WOOLLETT, Inspector of Stock, Cobar.

ALMOST everyone in the country is vitally interested in the rainfall of his respective district, and, although the rain gauge is the instrument universally used to measure the falls, there is often a decided want of knowledge or carelessness in the correct use of the instrument. Travelling about as the writer does, he has seen gauges located in such positions that the readings could not possibly be correct.

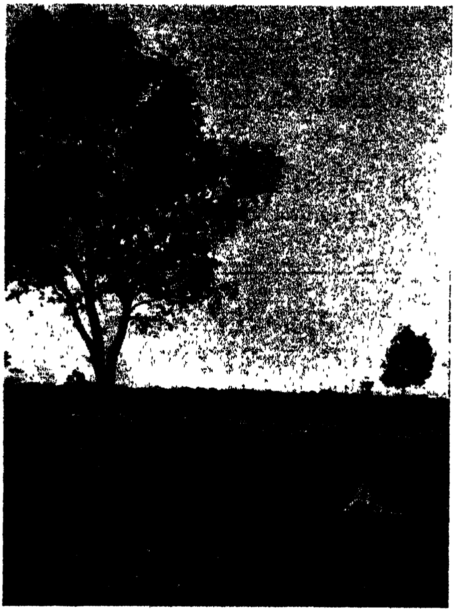


Fig. 1.—Rain gauge too close to a tree.

Fig. 1 is an example where the tree is altogether too close to the gauge, and, besides, the tree is in a north-easterly direction from the instrument, the point of the compass from which we get most of our rain. The best place for the gauge is in an exposed position, on or very near the ground, as in Fig. 2.

Trees or buildings should not be higher than their distance from the gauge. The following method of calculating heights is simple and approximately accurate:—

Obtain a yard stick, or one of some other convenient length, place it perpendicularly, and measure the length of the shadow. Then measure length of shadow of tree from butt. Suppose the length of shadow of yard stick was 2 feet, and that of the tree 30 feet. The stick was 1½ times as long as its shadow, and the tree will be in the same proportion to its shadow. One and a half times 30 is 45; so that 45 feet is the height of the tree. With other figures the calculation would be made in the same way.

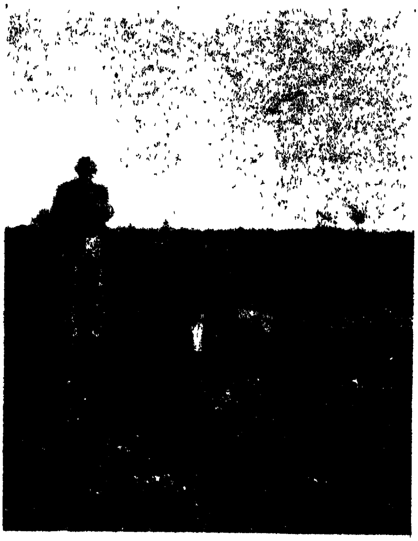


Fig. 2.—Correct position for rain gauge.

Gauges cost about 10s. in Sydney; but any boy or girl who understands a little mensuration and decimals could use a very simple apparatus. The writer's gauge consists of a 2 lb. golden syrup tin and a 2 oz. medicine glass; cost, 9d.

A fluid ounce of water equals 1·728 cubic inches, and there are 8 fluid drachms in an ounce. A medicine-glass is in nearly every home. However, care must be taken that a measuring glass is used and not tea, dessert, or table-spoons. It is generally said that two table-spoonfuls make an ounce, and that two dessert-spoonfuls are equal to a table-spoonful. The reader has only to try these domestic utensils to find that the rule is not reliable. He will readily ascertain that table-spoons vary in their capacity, and so do the others. For taking medicines the general rule will suffice, but not in calculating the rainfall by the method now to be described.

The rule is :—

$$\frac{\text{Fluid ounces of rain collected, x } 1{\cdot}728}{\text{Area of surface of receiving vessels in square inches.}} = \text{inches of rain.}$$

Where the top of a tin is rectangular the area of the collecting surface is ascertained by multiplying the length by the breadth; but where the top is round the rule for finding the area is:—Square diameter and multiply by ·7854.

The writer's syrup tin is 3 inches in diameter from the inside collar, which must be raised so that water collecting in the groove may not overflow into the tin. The area of surface is then 3in. x 3in. x ·7854 = 7·06 square inches. Supposing 1 ounce of rain was collected, by applying the above rule, we get:—$\frac{1 \times 1{\cdot}728}{7{\cdot}06.} = {\cdot}24$ inches.

As there are 100 points to the inch, each fluid ounce equals 24 points, and each fluid drachm is 3 points. In the event of a 10 oz. 3 drachm fall we will estimate it as 240 points and 9 points, totalling 249 points, or 2 inches 49 points.

The results are only approximate, but the writer's experience with the apparatus is that his records are very close to the official records of the town.

[Note.—Mr. S. Wilson, Divisional Officer, Commonwealth Weather Bureau, states that the formula given by Mr. Woollett for calculating the rain in a syrup tin is quite correct; but the Weather Bureau does not recommend any gauge but the standard. Mr. Wilson has just completed an inspection of the western and north-western stations, and found the rain gauges in very good positions. Of course there were a few exceptions; but they were always remedied where possible.—Ed.]

Eel-worms Attacking Roses.

The Manager of the Bathurst Experiment Farm recently forwarded a specimen of "Rose Canker" which had been submitted to him. The Bureau of Microbiology reported as follows:—

> Eel-worms (*Heterodera*) were found in the cankers, which are quite characteristic of the attacks of the worm on very many cultivated plants—vegetables, flowers, fruit-trees, &c. The worm may pass its complete life-history in the soil, or in the roots of the plant, in which latter place it may escape destruction by any treatment of the soil. If the galls as submitted are numerous on the plants, the latter would probably die, owing to the failure of the roots, so that, perhaps, the best results will be obtained by removing the roses and afterwards treating the soil. The treatments given are only suggestive, as no certain results have been obtained. Saturate the soil with carbolic, 1 in 20, or formalin, 1 in 200. Mix with the soil lime, naphthaline, or sulphate of potash. Applications should be made two or three times, and at intervals of about eight or ten days, as in that period the eggs hatch out in favourable circumstances.

Scalded Plains.

In restoring scalded plains to their proper state, it is generally found that cultivation, combined with manuring, has the desired effect. The use of superphosphate in small quantities, say at the rate of ½ cwt. per acre, when applied to a wheat crop, has proved very effective.—George Valder.

BEEKEEPING AND GRAZING ON POOR LANDS.

MR. THOMAS BOLTON read a paper on this subject before the tenth Annual Convention of the Victorian Chamber of Agriculture, and it has been reprinted in the *Australasian Beekeeper* for September, 1912. Mr. Bolton states that unrung country in his locality, 40 miles due north of Hamilton, Victoria, carries a sheep to 4 acres. Five years after ringing, it carries a sheep to 2 acres. He estimates the annual wool value per mile at £50 to £60 unrung, and £100 to £120 when rung. But the ringing destroys the honey flow, which, from five years' experience, he estimates at £110 per mile—a net loss of £50 to £70 per mile. There are many other forcible arguments in the paper, though of course it deals with this important subject from only one point of view.

A THREATENED NATIVE PEST OF ORANGES.

IN October, Mr. W. W. Froggatt visited an orchard at Dubbo, the grower having sent specimens of insects attacking his orange-trees. On examining the trees in flower, Mr. Froggatt found large numbers of a small spotted-winged psylla resting upon the foliage and tips of the branches, and sucking up the sap with their sharp-pointed beaks after the manner of aphis The insect has been identified as *Psylla schizoneuroides*, common in all the western country upon the Wild Caper Bush (*Capparis Mitchelli*), the specific name *Schizoneuroides* having been given on account of the large quantity of woolly matter secreted by the larvæ and pupæ when clustering on the branchlets giving them a marked resemblance to American Blight or Woolly Aphis upon our apple trees.

The treatment of the psyllids would be the same as that of aphids, viz., spraying with tobacco and soap emulsion ; but as they are, in the adult stage, much more active than aphids, they are more difficult to destroy.

Mr. Froggatt adds :—

> In Europe and America several species of this family are pests on fruit trees, and the Pear Psylla (*Psylla pyri*) is a very serious pest upon the pear tree. It is, however, in the larval and pupal state that most of the damage is done by these insects, and careful examination of a number of orange trees failed to show any sign of eggs or larvæ. We may therefore look upon the present infestation as a casual one by the winged insects that will not cause much damage to the trees. Australia is very rich in members of the family *Psyllidæ*, which appear to take the place of the aphids in other countries upon our native flora ; and knowing their destructive habits, we should always be on the watch for any species turning its attention to cultivated plants and trees.

STORING BUTTER FOR HOME USE.

IF for home use it is deemed advisable to store butter for a month or so, it would be well to provide an earthenware pot or pots, cleanse thoroughly, and fill up to within an inch of the top with butter, well packed. Then add a layer of damp salt over this ; next pour a layer of melted butter over the salt. Cover up with parchment paper and store in a cool, dry place, or bury 3 feet in the ground.—M. A. O'CALLAGHAN.

The Pineapple.

W. J. ALLEN.

PINEAPPLES have not been given the attention which they deserve by fruit-growers and farmers. Although the demand is much greater than the supply in our markets, still very few locally grown fruits reach Sydney, and we have to depend upon Queensland and the Islands for our supplies. On the coastal highlands, from the Manning River northwards, the pineapple thrives especially well.

On the route from the Bellinger to the Tweed there are several small plantations to be found, but most of the fruit grown is sold in the neighbouring townships. A well known grower, who has some few acres quite close to Bellinger township, reports that as much as £75 per acre can be secured from this fruit when properly cared for.

The principal point to bear in mind in pineapple-growing is that the fruit is a tropical one, and, therefore, it will not stand low temperatures; so, in selecting a site, be careful to plant where danger from frost is not imminent.

Although the pineapple does not require the very best soils, it is always advisable, where possible, to secure a free working soil that is well drained. The pineapple thrives on both the heavier volcanic soils and the sandy loams.

Propagation.

The plants are increased by the crown at the top of the fruit, the slips which cluster about its base, the suckers near the foot of the stalk, or the ratoons from the root. Suckers are generally preferred as being much the strongest and soonest to arrive at maturity. Ripe fruit may be expected from these in twelve months, and from slips and crowns in two years. Each stalk bears but once, and is renewed by the suckers, which should be thinned out to one or two; if more are left, the fruit will be small and inferior. The natural increase of the pineapple is exceedingly rapid.

Preparation of Ground.

The ground should be thoroughly broken up, say, to a depth of 8 inches, the season before the plants are set, and where possible, a crop planted which requires clean and thorough cultivation, so that the ground may be frequently worked and sweetened to bring it into a nice friable condition.

The offsets for planting are prepared by stripping away a few of the leaf-butts and paring the ends smoothly, which helps the formation of tap-roots. This brings the young plant in close contact with the soil, and encourages the roots to strike right away. Although this method is generally practised, some growers prefer to plant with the lower leaves spread out and covered with soil, which is firmly tramped around the stalk, care being taken that the soil does not become lodged in the centre of the crown of the sucker.

The sets should be planted on a level—slips, about 3 inches deep; suckers, 4 to 6 inches. When planting out, the rows should be from 6 to 8 feet apart, and the plants from 2 to 3 feet apart in the rows. Planted farther apart, they do not support and shade each other, and the fruit is liable to fall over and break off or be sunburnt.

The number of plants to the acre at various distances is as follows:—

2 feet by 3 feet—7,260 plants.
3 „ 3 „ 4,840 „
3 „ 4 „ 3,630 „
4 „ 4 „ 2,722 „
4 „ 5 „ 2,178 „

The offsets are generally planted in the summer and fall months, when the moisture needed for root development is supplied by showers. It is of importance that they should strike quickly and grow off at once; if they become stunted, the fruiting is naturally diminished and retarded.

Cultivation.

Cultivation should be strictly attended to so as to keep the plants strong and healthy. Weeds should be kept down. The period of profitableness of a plantation varies from five to eight years, but with thorough cultivation and fertilising it may last longer.

When the fruit is marketed long distances, it is cut before it is quite ripe, a portion of the stalk being left attached, or else the fruit will bleed. The crown is also left intact, and should not be trimmed, which would rob the fruit of its decorative appearance.

As a rule, there are very few pests to worry the pineapple-grower; but whenever a pine is found to be sunburnt and going bad from this cause, remove the fruit at once and burn or boil it. Fruit damaged in this way soon becomes rotten on the plant, and then becomes a harbour for beetles and other pests which in time may attack the healthy fruits.

Varieties.

There are many varieties of pineapples; but, for commercial purposes, the most widely grown as being the most delicious, hardy and best shippers, are Red Spanish, Smooth Cayenne, Porto Rico and the Queen. Other good varieties are Black Jamaica, Ripley Queen and Abbaka.

Queen.—This is the queen, par excellence, and the parent of the whole family of queens. The plant is free-growing, compact and handsome, coming quickly to maturity. Fruit of an attractive yellow colour, very juicy, of exquisite flavour, and a good keeper; weighs, 3 to 8 lb.

Red Spanish.—Usual weight, 2 to 6 lb.; sub-acid, juicy, hardy and early.

Smooth Cayenne.—Leaves long and smooth, or with very few spines, broad, dark green; flowers purple; fruit very large, pyramidal, dark orange yellow; flesh, pale yellow, rich, highly flavoured; pips large, flat. Does not sucker so freely as other varieties. Usually weighs 6 lb. to 10 lb. Largely grown for market.

Porto Rico.—A very robust plant, and producing very large fruit; a good shipper, of fair quality and flavour.

Ripley Queen.—Leaves green, with purplish longitudinal streaks running up the centre. The spines are numerous.

ULCERS IN STALLIONS AND MARES.

THERE have recently been brought under the notice of the Chief Inspector of Stock several cases of mares and travelling stallions suffering from an ulcerated condition of the genital organs. While the animals do not appear to be suffering from any specific disease, yet there seems to be no doubt that the affection is transmitted from one animal to the other during coition.

Owners of brood mares are advised to note the condition of the genital organs of stallions which they propose to use on their mares, and on no account to permit the use of any stallion which shows ulcerations on the penis. Any animal which becomes affected should be isolated, and treated by washing with a 1 per cent. solution of lysol, and the Chief Inspector of Stock will be glad if any cases noticed are reported to him, when steps will be taken, if practicable, to investigate the outbreak.

BEETLES ON GRAPE VINES.

A BINGARA man forwards specimens of a little Chrysomalid beetle (*Monolepta diversa*), which has been recorded several times as attacking flowering grape vines. Anything attacking the plants when flowering is difficult to deal with, as any spray or poison is liable to injure the setting of the berries. The vines might be jarred early in the morning, and the beetles caught on a sheet placed underneath, and then destroyed; but it would have to be done very early, when they are semi-torpid. They might also be driven away with smoke, as is sometimes done with the Rutherglen bug. Tobacco and soap wash is the only safe spray; it would not kill them, but might drive them away.—W. W. FROGGATT.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary
Albury	Mr. J. D. Lankester, Albury.
Balldale	Mr. H Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
Cardiff	Mr. D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. H. Vickers, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Derain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Kareela	Mr. L. Haydon, Kareela.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S Stening, Little Plain, *via* Inverell.
Lower Portland	Mr. G. Gosper, Lower Portland.
Mangrove Mountain	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *via* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, "Vila," Penrose.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Samples of Wheat.

It has been decided to supply branches of the Agricultural Bureau with samples of grain and bunches of heads of the twenty-two varieties of wheat recommended by the Department for cultivation in various parts of the State. These comprise the leading varieties recommended for grain, hay, dual purposes, and green fodder. The collection should prove a valuable acquisition, especially for identification purposes, to members of branches in wheat-growing districts.

Secretaries intending to avail themselves of this offer are requested to make early application to the Department.

Lectures and Demonstrations by Departmental Officers in Course of Preparation.

Place.	Subject.
Milbrulong	Unsoundness and Conformation of Horses.
Jiggi	Culture of Green Winte Fodders.
Kareela	Poultry Raising.
,, ...	Veterinary Lecture.

NOTES AND REPORTS FROM BRANCHES.

Bathurst.

Mr. R. W. Peacock, Manager of the Experiment Farm, lectured on "Wheat-growing" to a number of farmers in the Perthville Public School, under the auspices of the local Agricultural Bureau, during last month. Lantern views of the various methods of soil treatment were shown. The lecture was much appreciated by those present, and Mr. Peacock has been asked to give a similar lecture at George's Plains at an early date.

Bungalong.

At the last meeting of this Branch, Mr. Pareira read a paper on the effect of bluestone on the germination of wheat. Mr. Pareira said that his experience has taught that bluestoned wheat would under dry conditions lie in the ground as long as untreated seed without germinating, provided the seed was sown when thoroughly dry. Half a pound of bluestone to a kerosene tin of water was advocated as being the right quantity to use.

DEPARTMENTAL NOTE.—The quantity of bluestone to use is 1½ lb. to 10 gallons of water. The seed should be steeped in this solution for three to four minutes, and care should be exercised to steep in such a way that every grain becomes thoroughly wetted. After having been drained the wheat should be dipped in a solution of lime-water, which is made by stirring 1 lb. of unslacked lime into 10 gallons of water This mixture should be allowed to stand until the clear lime-water can be drained off; into this clear lime-water the bluestoned wheat should be dipped. This is preferable to dipping it into the milk of lime.

Carlingford

On 20th September a meeting of this Branch was held to hear an address by Mr. H. R. Bowles, the Secretary of the recently formed Fruitgrowers' Co-operative Society.

Mr. Bowles explained that the objects of the venture were to secure better returns for growers from the sale of their fruit, the co-operative purchase of commodities, the opening of a jam factory to deal with surplus fruit, and the many other advantages that follow in the train of co-operation. Mr. Bowles gave details as to the formation of the company and the lines upon which it would run, and indicated the support that was being accorded the proposal in the various fruit-growing centres of the State.

Coonabarabran.

The second meeting of the above Branch was held in the Shire Hall on the 5th instant, with a good attendance of members present.

Question by the Secretary:—What is the best method to introduce improved sorts of grasses, native or others, into large paddocks?

The question caused a very interesting and instructive discussion, during which the following methods were recommended:—

1st. Enclose, cultivate and sow with grasses desired, small portions at heads of valleys; when in full seed, stock up; stock will distribute seeds, and seeds falling will be washed to the lower lands by rains following.

2nd. To introduce seed by stock, at regular intervals, from good grassed country.

3rd. The mixing of suitable grass seeds with pollard when poisoning for rabbits with poison cart.

4th. In rough grass country ringbark, burn off coarse grasses, and keep eaten down with large stock from good grassed country for two or three seasons; good grasses and clovers have been introduced by this method.

5th. Extermination of rabbits; light stocking with sheep and heavy stocking with cattle.

The following grasses found favour with members for grazing purposes :—Couch, Paspalum, *Phalaris commutata*, and Canary grass ; though all admitted that some of our native grasses were amongst the best.

Resolution :—That the Department of Agriculture be requested to furnish this Branch with information as to the best method of eradicating inferior grasses and introducing improved varieties, native or others, into large paddocks, in a district where frosts are severe.

DEPARTMENTAL NOTES.—*Eradication of Inferior Grasses.*—The inferior grasses in a district such as Coonabarabran are principally wire and corkscrew grasses, three-awned spear grass, and barley grass (when mature).

Barley Grass.—When barley grass is mature the spear-like seeds are very irritating and injurious to stock. But as it is an annual, and provides a fair amount of feed in its young state, when most grasses are dormant, it must be considered a grass whose advantages outweigh its disadvantages.

Wire, Corkscrew, and Spear Grasses.—These are very wiry, innutritious grasses, the spear seeds of which are also injurious. They grow in bunches or clumps. If a paddock contains a minority of them in proportion to the better grasses, individual hoeing, pulling, or burning would be the best way of getting rid of them. If a paddock is crowded with them (as is often the case), it would pay to burn off the whole paddock and lay down to better grasses. Once good grasses are established in a paddock, careful nursing of these grasses, and discriminate stocking, will eventually crowd out the inferior kinds.

Introduction of better Varieties.—It is a difficult, almost impossible, matter to obtain a grass that will stand the extremes of both heat and cold. One cannot expect to get a stand of the same grass all the year round. A good plan, therefore, is to divide an area up into winter and spring paddocks, and summer and autumn paddocks.

Winter Grasses.—New South Wales is unfortunate in possessing no native winter grasses over the greater portion of its area. One has to rely on such introduced grasses as *Phalaris commutata*, Prairie, *Bromus inermis* (Hungarian Brome), and Cocksfoot for winter feeds. The last three are easily propagated from seed, while Phalaris requires root-planting to obtain a good stand. These grasses last well into the spring, when the native grasses have a good stand.

Summer Grasses—Couch and Paspalum, as advocated by the local branch of the Bureau, are good grasses if the conditions are suitable for their growth. If Paspalum is desired, it will be necessary to isolate an area of it, as no other grass has a chance with it once established. The same remark applies more or less to couch.

Native Grasses.—The best native grasses (and they are really good grasses) in such a district as Coonabarabran would be the Blue grasses (*Andropogon sericeus* and *Andropogon intermedeus*), Mitchell grass, Wallaby grass (*Danthonia semiannularis*), Kangaroo grass (*Anthistiria ciliata*), Windmill and Star grasses, and the Panic grasses.

There are many difficulties in the way of improving native pastures by the use of seed of native species, the chief obstacle being the difficulty of securing the required seed. Another obstacle is the difficulty of judging the seasons properly. Seed is more likely to be collected during a favourable season, when the crop is good, and then sown in the following year. The next season after a favourable one is more than likely not to be favourable for seed germination. Although we may place the seed of native species under conditions more or less similar to those found in nature, when the seed is gathered and sown upon uncultivated soil, the chances are against its success. Even in cultivated soil, native grass seed will not germinate as well as introduced grasses if the conditions are at all unfavourable.

It is, therefore, evident that time, labour and expense are required to obtain good native pastures, but the difficulties are surmountable, and the result would certainly repay the trouble.

The suggestion of members of the branch of the Bureau to sow the native grass seed in small suitable areas for a start, such as at the head of valleys, is a very good one. The areas could be increased each year, and the seed would, in natural course, be washed to lower levels, and there germinate under favourable conditions. It is unadvisable to rely too much on stock distributing the seed (as suggested), but more advisable to allow the grass to reseed itself. Portions of the pastures could be rested at intervals during the summer and autumn months, in order to allow the grasses to drop the seed. Americans also adopt the method of ploughing furrows in the land haphazard. This helps the seed to lodge itself when acted on by the rain or wind ; it has a chance of being covered with humus, and its tendencies for germination considerably increased.

By systematically increasing the small areas of cultivation each year, and nursing the grasses already established, a very large improvement would result.

At first sight it appears to be false economy to allow grass to go to seed and not be utilised, but when we consider that by such reseeding the areas will eventually be able to carry a much larger amount of stock, the wisdom of the method is evident.

Heavy stocking with sheep, as members of the branch suggest, is to be condemned. By eating out the crown, the roots of the grass are exposed to the sun and eventually destroyed.

The other recommendations are very efficient and practicable.

It is suggested that the local branch make a collection of the native grasses in this area, and forward them for identification and report as to their value. This would give those who are not thoroughly familiar with our native grasses an opportunity for watching and nursing the better varieties.

Pit Ensilage.

A very interesting paper on pit ensilage was read by Mr. H. E. Crane, who also gave some useful information from his experience with tub silos.

He preferred maize to lucerne for ensilage. His dairy cows had given an increase of 1 lb. of butter per head per week when feeding on maize silage, but they would not eat the lucerne silage.

It was pointed out by Mr. Cox that care must be taken in making pits to select clay or stiff soils on high ground to prevent soakage of waters. He had been very successful in making lucerne silage, but recommended chaffing in all cases, on account of the difficulty in getting out the first cuts in each layer. He preferred stacking to pits. If properly stacked there was very little loss.

Mr. Hagan had been successful with a stack made with alternate layers of straw and lucerne. The stack opened up good and sweet.

In reply to a question by Dr. A. D. Barton, several members said there was no taint in milk or butter from cows fed on silage.

A vote of thanks was accorded Mr. Hutchinson for the instructive demonstration of the practical use of wire, which included many useful emergency tools—bradawls, split links, hinges, rivets for mowing-machine knives, and the Simplex wire-fence strainer.

Cowra.

Mr. J. W. Mathews, Sheep and Wool Expert, delivered a lecture to the members of the above branch on 3rd October.

Mr. Mathews pointed out that this district is eminently suited for breeding cross-bred sheep, possessing a fairly reliable seasonable rainfall, and being an important agricultural centre. For local conditions, the "L M." combination was recommended for the raising of a dual-purpose sheep. For raising export lambs, one of the breeds included in the Shortwool or Down group was recommended. With a view of obtaining earlier development, breeders were recommended to give the Dorset Horn a trial; the combination "$D_5 - L_1$ M" should be suitable for local conditions.

Explanation of the symbols here used will be found in Farmer's Bulletin, No. 53, on Cross-breeding of Sheep, which was distributed amongst the members present.

For strictly grazing purposes, the Merino was recommended, and as the district is situated well within the regions of the temperate zone, the medium-woolled strain of Merino is the type recommended.

Crudine.

A practical demonstration in Wool-classing, in the afternoon, followed in the evening by a lecture on breeds of sheep and Merino types, was given by Mr. J. W. Mathews, Sheep and Wool Expert, on the 2nd November.

A lecture on bee-keeping was delivered by Mr. R. G. Warry, Demonstrator in Apiculture, to the members of the Crudine branch of the Bureau, on the 8th October. A fairly large and enthusiastic audience greeted the lecturer.

Mr. Warry, during his lecture, gave many interesting points. He said that one of the apiarist's best assets is a complete set of straight strong combs. To obtain these, the first consideration will be the size and shape of the wooden frame in which they are to be built. Several years' experience and a good deal of experimenting have proved the "Langstroth" size of frame the best for use in the brood-chamber of the hive.

A modification of the the original Langstroth frame—the Hoffman Self-spacing Frame—may appear to have complicated parts, though, in reality, it has rendered the manipulation and examination of combs easier, whilst colonies of bees hived on Hoffman Self-spacing frames can be quickly packed for shipment, and travel with greater safety than when hived on the old-fashioned "thin top" frames.

The self-spacing frame ensures, as nearly as possible, a natural bee-space throughout the hive, thus avoiding too much brace comb, and, consequently, allowing the apiarist to examine his combs without breaking honey cells and tempting robber bees to attack the hive on which he is working.

The thickness of the top bar in the Langstroth-Hoffman (self-spacing) frame has been determined by the thickness of comb the bees build for brood-rearing purposes.

If a full sheet of comb foundation is used in one of these frames, a brood comb will be the result, whose surfaces are flush with the edges of the top bar of the frame: when a set of such combs are crowded in the brood-chamber as closely as the spacers on them will allow, brace comb is avoided, and a close warm cluster of bees obtained, which is beneficial in every way to the colony.

In every normal colony of bees there are three kinds of inmates—queen, worker bees, and drones Of these, one kind, the drone, is to a great extent unprofitable to the bee-keeper. Whilst in the larval state the drone consumes quantities of chyle food, and when adult, gathers no honey or pollen, all the while feeding on the stores gathered by the worker bees. His mission is to fertilise virgin queens.

Bees nesting in a tree or hived in a box without any movable frames with comb foundation, will rear large numbers of drones, seventy-five per cent. of which, probably more, never meet with a virgin queen, only living as a tax on the colony until they are slaughtered at the beginning of winter. Obviously so great a quantity of drones is unnecessary. It can be materially lessened by use of full sheets of foundation.

Comb foundation is an artificial mid-rib impressed with the bases of the worker cells only. Its use in every frame ensures comb in which worker bees alone can be raised.

It is practically impossible to eliminate drone comb altogether from a hive, but a generous use of comb foundation will so restrict the bees, that only sufficient drones to mate with the virgin queens of the apiary are produced. Thus a gain in honey and chyle food is obtained.

Every frame in a hive, whether for use as a honey-storing frame or a brood frame, should be wired. The wires must be imbedded in the foundation, and strained as tightly as the stability of the frames will allow. The wires not only serve to strengthen the comb, but keep the sheet of foundation exactly in the centre of the frame. In warm weather, if an unwired comb is held with its surfaces horizontally, the weight of the honey in the comb will cause it to sag and fall out of the frame, whereas a properly-wired comb may be held in any position without fear of disaster.

Shallow Extracting Frames.—An extracting frame coming into favour among bee-keepers is the shallow or half-depth frame; it is gradually taking the place of the brood-frame size comb for use in crates or supers.

The blade of an uncapping knife should always be long enough to rest on both top and bottom bars of the frame at once; by using the shallow frame a much lighter knife can be used, which will be found an advantage. If brood-frame size combs are used in the supers, a strip of cappings not less than 7 inches wide has to be taken off the whole length of the comb. It is not easy to make this the neatest of jobs, the honey cells being so easily damaged.

The extractor must be turned gently while deep combs are in the baskets, especially if they are new; only old and tough combs will stand a high speed on the extractor reel without bulging or splitting.

On a ten-frame hive, it is well to use nine shallow extracting combs in the supers, spacing them evenly with the fingers. This allows the bees to build the comb out a little wider than the frame, so that when the honey is capped, the honey knife can pass clean under the cappings and cut the comb neatly to the thickness of the frame.

A short knife is so well supported on a shallow frame that there is very little fear of damaging the honey cells if the knife is kept sharp. With a little practice a neat job can be made of both sides of a shallow extracting frame in less than half the time taken to uncap both sides of a brood-frame comb.

The comb in an "Ideal" or shallow extracting frame will not contain as much honey as the comb in a brood frame, although it holds more than half as much, but owing to the ease with which it is uncapped, an average hand can deal with about two and a half "Ideal" combs in the same time that it takes him to uncap one brood comb.

Hives.—In Australia, where honey flows are often heavy, but of short duration, the quickest methods are essential when extracting. Badly made brood chambers, with ill-fitting top storeys, are one of the main drawbacks to successfully robbing hives prior to extracting the combs.

At the outset, many do not consider their knowledge of apiculture extensive enough to warrant much expenditure on machine-made goods, but prefer to make their own hives out of cases, kerosene cases in particular. It is not difficult to make hives out of cases which, for a time, will be no hindrance to taking out combs when robbing; but the weight of one honey crop is often enough to put them out of shape, the joints at their corners begin to gape, and wherever two boards had to be used to form the side of a hive, long chinks appear.

If a beginner is obliged to make use of cases, one good standard hive should be purchased or borrowed; from it measurements can be taken, and in this way the right bee space obtained between the frames and between the separate storeys of the hive.

The Importance to a Colony of its Young Bees.—Thorough feeding of bees when in the larval stage, especially of queen bees, is the prime factor in producing active adults.

To the young bees, just emerged from their cells, is entrusted the duty of feeding the larvæ in a hive.

When feeding larvæ, the bee disgorges chyle from its chyle stomach. In young bees, this chyle stomach is highly developed; older bees, whose duties lie outside the hive, have to some extent lost this development, although they are able to rear brood if occasion demands.

This must be borne in mind when queen-rearing or making increase, two cases where a large demand for chyle food is created.

Queen cells may be started by any bees, young or old, but for their actual care and food, they may be placed among combs of hatching brood, where plenty of young bees would have access to them.

Where increase is made by moving a hive to a new stand in the apiary, and catching the flying bees on the old stand, the extra queen which becomes necessary should be reared in the old hive; where there is an abundance of young bees to feed the cells the bees will start, the laying queen from the original hive being kept on the old stand with the flying bees. Some hatching brood should also be left on the old stand to supply the young bees necessary for feeding the first batch of brood reared in the new hive.

If a laying queen is available, she can be introduced to the new colony, which will go ahead more quickly. At the same time, the old hive will not be in charge of a queen reared in an emergency cell. Such queens are not, as a rule, very prolific.

Brood Diseases.—If a percentage of the hives in an apiary are found to be attacked with foul brood of bees or any form of infectious brood disease, they can only be successfully treated when the material used for housing the colonies is sound and in good order. Where bees have access to the combs of a hive by any other means than the entrance (legitimate entrance) of the hive, the rapid spread of the disease cannot be controlled with any certainty.

For foul brood, spraying with chemicals was not advised, as nothing that can be used in a spray has yet been found that will do more than arrest the disease.

The M'Evoy, or starvation treatment, was urged as the only method effecting a permanent cure if properly carried out.

The great necessity for preventing bees robbing each others' hives while the apiary is under treatment was emphasised.

Care was taken to point out the difference between brood attacked by any of the foul-brood bacilli and brood-dead from chill, scalding, or any cause not disease.

A hearty vote of thanks was accorded Mr. Warry for his interesting address.

Derrain.

A branch of the Agricultural Bureau has been formed at Derrain. The following were elected office-bearers for the ensuing year:—Mr. J. D. Palmer, Chairman; Mr. Charles Haines, Vice-Chairman; Mr. A. Beresford Hunter, Treasurer; and Mr. A. P. Hunter, Secretary.

Forest Creek.

Mr. J. W. Mathews, Sheep and Wool Expert, visited Forest Creek on the 7th, 8th, and 9th October, and in addition to inspection of members' flocks, demonstrations in wool-classing were given.

In the course of his lecture Mr. Mathews pointed out that the district possessing a temperate climate is favourable to the development of both the Merino and various cross-bred Merino-Longwool types; but, in view of it being situated some considerable distance from the railway, it does not hold out much inducement for the raising of lambs for export. The district is for the most part pastoral, and eminently suited for the breeding of the medium to superfine Merino strains. It was found, however, that certain areas were devoted to the growth of lucerne and fodder crops, and where these methods of supplying the necessary feed to the sheep are adopted, the Lincoln-Merino cross-bred is recommended.

In addition to practical demonstrations given at one of the members' homestead, a number of members' flocks were inspected. The advisability of breeding for a more uniform class of sheep was pointed out to members, and they were told that this could only be done by giving greater attention to the culling of all inferior classes of sheep, and breeding from the better class of ewes, which might be undertaken to greater advantage. A better class of ram might also be profitably introduced, in the case of many of the flocks inspected. The class of Merino ram recommended is a medium-woolled, plain-bodied sheep, possessing a good length of staple consistent with density and character of fleece. Suitable specimens of breeds were used for the purpose of demonstrating these points.

In the classing of wool, the necessity for closer supervision in the matter of skirting and rolling the fleeces was particularly emphasised, together with the maintenance of uniformity in classification of the fleeces and the pieces.

Whilst duly observing these items, it was pointed out that the classing of wool should not be overdone. The number of sorts made should depend upon the size of the clip, but fleeces of uniform quality, length, and "condition" should be made into classes and packed separate from those which are coarser and others which are heavier in "condition."

The usual monthly meeting of the above branch was held on the 12th October. The principal business was a discussion on the demonstration on wool-classing, given by Mr. J. W. Mathews on the previous Wednesday. All present were of opinion that much benefit had been derived from the demonstration, and a resolution was carried that the heartiest thanks of this branch be conveyed to the Under Secretary, Department of Agriculture, for the instructive lecture delivered by Mr. Mathews.

Inverell.

At the last meeting of this Branch a very good motion by Mr. Arkinstall was carried, to the effect that all articles for debate be prepared by the various members prior to the meeting and handed to the Secretary. This will ensure the article being read and a discussion following whether the member who prepared the article be present or not, as in the latter case the Secretary or any of the members present can read the paper in question. Other Branches might with advantage follow this practice.

Jiggi.

Arrangements are being made for Mr. G. Marks, Inspector of Agriculture, to deliver a lecture to members of this Branch on "Culture of Green Winter Fodders" early in December.

Kellyville.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a demonstration on "Summer Pruning" to the members on the 29th of last month.

Leech's Gully.

On 18th October Mr. Max Henry, M.R.C.V.S., delivered a lecture to the members of this Branch on "Tuberculosis in Cattle."

Milbrulong.

Arrangements are being made for a Veterinary Officer to deliver a lecture to the members of the Milbrulong Branch on "Horses: Unsoundness and Conformation."

New Italy.

A lecture on Viticulture and wine-making was delivered by Mr. M. Blunno, Viticultural Expert, to a good attendance of members of the above Branch.

Mr. Blunno said that the New Italy district may be considered as being on the northern limit of the zone adapted to vine-growing, the winter being too mild and not allowing the vine to rest; besides this, the season when the grapes are ripe is visited by frequent rains, which very often make the crop or portions of it unmarketable.

Many vines in the vineyards of New Italy shoot again as soon as the crop is ripe, when, on the contrary, they should begin to rest. On occasions the shoots produce blossoms in May, and these set; but the fruit does not come to maturity, because of the winter temperature, which is not sufficiently high for the ripening. The vine, being exhausted by this second period of vegetation, cannot very well carry and feed a normal yield during the proper vegetative period. It is noticed that in spring the same varieties of vines of the same vineyard do not shoot simultaneously, some being more backward than others; some are hardly budding, in fact, while the others have shoots 14 or 15 inches long. The vines that are so late in coming on are those which had begun in autumn to grow again. In New Italy we are practically on the fringe of the subtropical country; in real subtropical or tropical countries vines cannot be profitably grown, because all the year round they are in continuous vegetation, and at any time in the year bunches are to be found at different stages of ripening.

In the County of Cumberland during the summer 1910, and early in 1911, a long period of wet weather occurred, when the Late Sherry grape vines lost all their leaves, and the crop, besides not ripening, was spoiled by the rains. In April and May followed hot and sultry weather, and those vines entered for the second time into vegetation, which was stopped by the winter temperature. Then in the spring it was found that all those vines that had entered for the second time into vegetation started much later than usual, so much so that the generality of the growers believed they had died. At any rate they showed a very poor crop. Now this is what more or less happens every year in the New Italy district. The soil is not too poor for vines—vines grow luxuriantly in far poorer soils. On the other hand, it is advisable to manure the soil fairly heavily to make up for the exhaustion to which the soil is subjected, on account of the second vegetation in early winter. The trouble is accentuated by the fact that the ground in many places was a rather impervious subsoil, which is not penetrated by the roots; they are thus compelled to live close to the surface of the ground. An application of superphosphate and sulphate of potash, also of gypsum, which should act well in such clay soils, is advocated; green manuring, in order to increase the proportion of nitrogen necessary for a more vigorous growth, is also advisable

The Isabella grape does better than any European kind in this district; therefore, practically all the vineyards consist of Isabella. This vine is a hardier one; its habitat in its native districts of the United States of America is much like our south coast as far as Nowra, and like our north coast districts. The Isabella is not liable to oidium; therefore very suitable for districts where the clammy days during the spring and summer are numerous.

In September, 1910, the Department sent 100 rootlings of about ten different sorts for trial in the district. Several of them had borne some fruit last season, and it was found that among the different sorts the Chasselas stands out most favourably, for it produces beautiful fruit, which is ripe in the middle of December, viz., four or five weeks earlier than any grape in the County of Cumberland. The Chasselas, therefore, should be propagated; thus the growers at New Italy would be able to put the first grapes of the season on the Sydney market.

The varieties that do best for table use are the Black Hamburg and Black Muscat Hamburg, the Royal Ascot, and a variety of white Muscat, which locally is called White Muscat of Frontignan. The New Italy district, however, comprises some hills, and as elevation is a corrective of latitude, it is advisable to plant the vineyards on the slope of those hills 300 or 400 feet above the elevation of the present vineyards; the temperature during the various seasons would then be more suitable to vine-growing, and the lamented inconveniences above referred to would be avoided.

As the vintage takes place during the summer months, when fermentation is not easily controlled without resorting to some devices in order to decrease the temperature of the grape juice, Mr. Blunno advised not to crush the grapes when too hot, but to pick them only in the early morning and crush them while still cool, or else spread them over a table or tarpaulin and allow them to cool during the night and crush them next morning. Farmers were exhorted to use a thermometer to take the temperature of the juice at the time it is put in the fermenting vat, and thenceforth twice a day while fermentation lasts; also the necessity for using a saccharometer to test the proportion of sugar contained in the grape juice was pointed out. When the juice is put in the vat the saccharometer should be used, and the test repeated twice a day at the time when the temperature of the fermenting juice is taken, in order to see how the temperature rises while the sugar decreases, and thus watch the progress of fermentation. If the temperature of the must when put in the vat is, say, 70 degrees F., it is quite likely that during fermentation the heat will go over 92 degrees F. It is not desirable that such temperature be exceeded. Generally speaking, the lower the temperature of the juice during its fermentation the better will be the wine. A fermentation taking place at a low temperature will take longer to complete because it will be slower, but the wine will be better. The winemaker should keep watch over the fermenting juice, and see how the temperature rises and how the sugar decreases correspondingly. Supposing the grape juice just put in the vat contained, say, 20 per cent. of sugar, when the proportion will have come down to 10 per cent. most likely the temperature, which before fermentation was 70 degrees, will be now 85 degrees.

These figures are only thrown out haphazard, because, although it is exactly known how much heat is produced by one part of sugar which is transformed into alcohol and carbonic acid, yet in practice we have to deal with a bulky liquid, and it cannot be told how much of the heat produced will disperse, and how much will accumulate and be retained by the fermenting juice; many factors concur in this, not the least, the size and shape and material of which the fermenting vessel is made. Assuming, therefore, that the proportion of sugar has come down to 10 per cent., and the temperature has risen from 70 degrees to 85 degrees F., it is certain that the critical temperature of 92 degrees F. will be reached before fermentation comes to an end. It will be necessary, then, to prevent this by allowing some of the heat to disperse, which can be attained by bucketing the fermenting juice into another vat, or, better still, by having a coil of pipes inside the fermenting vat through which cold water is run; thus some of the heat is extracted from the too warm juice. Otherwise the temperature may be lowered by checking the too great activity of the yeast, by dissolving in the juice and thoroughly incorporating with it some metabisulphite of potassium. Metabisulphite of potassium is a harmless compound which, when mixed with the juice of the grape, splits up and gives off half its weight of fumes of sulphur. These sulphur fumes spreading through the juice check the activity of the yeast, thereby allowing the sugar to more slowly be transformed into alcohol and carbonic acid, thus giving more time for the heat produced to disperse. The practical way of doing this is to add to the must 1 oz. of metabisulphite to every 100 gallons when it is put in the vat to ferment; then when the temperature is about 82 degrees, another ounce is put in, and finally, if there is still too much sugar left, say 7 or 8 per cent., another ounce. This substance is in white crystals, and is sold at 2s. 6d. per lb. Before using it, it is pounded fairly fine, then dissolved in a pint of water, and well mixed with the fermenting juice. There and then this metabisulphite discolours the juice, but not only will it regain its original colour, but it will become much brighter.

It may happen that during winter the wine obtained from grape juice so treated will have a peculiar odour, reminding one of rotten eggs. This is due to sulphuretted hydrogen, and the same thing frequently happens when wine is made from grapes that have been sulphured not long before vintage to prevent a late outbreak of oidium. This peculiar smell will, however, soon disappear if the wine is racked into another cask.

Walla Walla.

Mr. H. S. Major, Assistant Sheep and Wool Expert, visited Walla Walla on the 9th, 10th, and 11th October.

During his stay Mr. Major visited the farms of several members while shearing was in progress, giving advice in connection with wool classification, rolling and skirting. In view of the suitability of the locality, he recommended the keeping of a good uniform class of Merino. In the matter of wool classification he advised farmers to pay special attention to the skirting of their fleeces and the correct method of rolling. Lighter skirting round the neck and fore part of the fleece, but heavy skirting round the hind-quarters, was advocated, more especially the removal of the coarser breech section. Two classes for the fleeces were recommended, differing chiefly in length of staple and condition (or the amount of yoke present). Mr. Major considered that the skirting in the case of these small clips could, with advantage, be classed into two main lines—(a) comprising the bulk fleeces, and (b) the trimmings removed from the latter class. All urine-stained wool should be kept separate to be dried before packing.

Mr. Major also gave advice and selected the most suitable rams for the ensuing season's mating. Practical instructions in up-to date methods of preening and branding bales was also dealt with.

Mr. J. W. Mathews, Sheep and Wool Expert, visited the farms of members of the local Branch on a previous date.

In the course of his lecture Mr. Mathews said that this district is very suitable for lamb-raising. The date of mating and the time at which the lambs should be marketed were fixed in accordance with climatic conditions and the suitability of locality. The lambs should be dropped during the month of May. The time at which they are to be marketed, it was pointed out, would depend upon the combination of breeds employed. For high standards of quality, the combination of "D_1-L_1M" was recommended; but, in view of the fact that an earlier maturing breed might be used to more profitable account, breeders were recommended to try the combination represented by "P_5-L_1M." The question of the growth of fodder crops was specially referred to, and it was pointed out that, in order to keep the lambs in a vigorous growing state, an ample supply of suitable feed should be provided to carry the lambs and their mothers over the colder months of the year.

The above symbols, signifying the various combinations of breeds, will be found referred to on page 125 of Farmers' Bulletin, No. 53, on Cross-breeding of Sheep. Copies were distributed amongst the members present.

On the second visit a demonstration was held on the methods adopted in culling and classification of Merino flocks, at the homestead of Mr. E. W. Wenke. Greater uniformity in the flocks is essential, and it was pointed out, to maintain this, it was necessary that the flocks should, prior to shearing, be thoroughly overhauled for the purpose of culling all inferior animals and those becoming too old to breed from.

Special attention to the selection of the ram was also emphasised. It would always be well worth while to pay a little more and obtain good stock.

Orchard Notes.

W. J. ALLEN.

DECEMBER.

Codlin Moth.

KEEP a strict watch over bandages on the apple, pear and quince trees, and see that all fruit is picked up and destroyed, either by boiling or burning it, but not by burying it, as a few of our careless growers have tried to do. It is to the interest of every grower to see that every grub is destroyed before it can fly. The man who buries his fruit is only breeding moths for himself and his neighbours, and, in the interests of the fruit industry, it is hoped that any growers who may be found resorting to this means of disposing of their fruit will be reported to the Inspectors and made an example of. We hope that growers will assist the Inspectors in every way possible, and that where they know of those who are trying to evade the Act they will report them.

The amended regulations under the Fruit Pests Act allow growers the option of bandaging or spraying. If the latter method is adopted it must be with an approved brand of arsenate of lead, and there must be at least three sprayings --the first within five days of the petals falling from the flowers; the second within four weeks: and the third within nine weeks from the same time. Though only three sprayings are thus provided for, a fourth spraying is very necessary, and should be applied at the end of January, to catch the late brood.

Complaints have been made by a few orchardists of the burning of the foliage with arsenate of lead. As there are several brands on the market, it would be well for orchardists to apply the spray to a section of a tree of the different varieties in the orchard, as by making such tests one is enabled to ascertain if the mixture is too strong, and if so, the quantity of arsenate of lead may be reduced, so that no scorching or damage to either leaves or fruit will occur. Some varieties are more tender than others, and by carrying out experiments as described above, the grower will know how to reduce the strength of the arsenate of lead when spraying such varieties. The first spraying, to be given just as the petals are falling, should be the strongest application, while for subsequent sprayings the quantity of arsenate of lead may be reduced to 1½ lb. to 50 gallons of water, and it may be found that for some brands of arsenate of lead 2 lb. to 50 gallons of water will be quite strong enough for the first application.

By testing the spray on a few trees before proceeding to treat the orchard, the possibility of damaging foliage or fruit may be avoided.

Fruit Fly.

Though orchards were very free from this pest last season, it must not be forgotten or neglected. If it makes its appearance, kerosene traps set around the trees or hung from the branches are recommended. These traps are tins about 5 or 6 inches square and 2 inches deep, with a half-inch of kerosene on the bottom. Pick up and boil or burn all fallen and infested fruit every day.

Thrips.

Bulletin No. 228 of the University of California College of Agriculture reports the results of experiments in the control of thrips, near San José, California. Whitewash made with 80lb. of quicklime for 100 gallons of spraying material was used, the whitewash being sprayed through a wire screen with a mesh of one-fourteenth inch, and the same sized screen was used on the suction hose of the pump. The application was made with a hand pump, but without constant agitation the first year, with the result that the last whitewash was thicker than the first. This application was made when very few blossom buds were open sufficiently to admit the thrips. At the time of full blossom it was very apparent that the number of blossoms was in direct proportion to the amount of whitewash. The trees that had a thin coating of whitewash had very few blossoms, those which had a very thick coating of whitewash had abundance of blossoms, and the amount of fruit later, corresponded to the amount of blossoms. The next year's results were the same.

It was found that the ordinary Bordeaux nozzles worked well, but it was necessary to enlarge slightly the opening in the discs of the Vermorel type nozzles. It is very important to have the lime properly slaked. Good lime properly slaked is of creamy consistency, with a negligible amount of grit, and it forms a smooth, uniform, creamy coating on the tree.

It was not found necessary to spray a second time for larvæ, one application proving sufficient to protect the blossoms and permit setting of fruit, but it would appear that in some cases a second spraying with a good contact spray would be necessary.

Other Pests.

For scales on citrus trees, December, January, February and March are good months for either spraying or fumigating; but for fungus diseases it is generally best to spray once before the tree blooms, and again as soon as the fruit has set, rather than leaving it until now. In many cases, however, later sprayings are both beneficial and necessary. The grower should not neglect to either fumigate or spray all citrus trees so as to ensure clean fruit and healthy trees, but do not treat trees that are weak and out of condition, else they may be damaged.

Pumpkin Beetle.

The Orchardist at Hawkesbury Agricultural College reports as follows:—To every pound of slaked lime add one-quarter ounce of Paris green. The handiest way to apply it is to make a bag of double cheese-cloth, put the mixture in the bag and shake gently over the plants. One man can go over several acres in a day. I find it much more convenient than spraying. The operation must be repeated every time wind blows the lime off or it is washed off by rain. Apply early in the morning, as it sticks better when the plants are damp. Some growers have given occasional sprayings with arsenate of lead, which they claim has given good results.

Exporting Apples.

It is time to make arrangements for space in boats, if fruit is to be sent to Europe this coming fall. It would be well for those who have a good crop to arrange to send a trial shipment, be it ever so small, either in conjunction with some person or company who is exporting, or, better still, through the medium of the Fruit-growers' Union.

Irrigation.

Where irrigation is practised it will be found necessary in most cases to give the soil a good soaking this month. Where young trees or vines are being watered, see that the soil is well soaked around their roots, and as soon as the ground is dry enough after the watering, cultivate the land thoroughly, and work around the trees and vines with a fork hoe.

Fruit-curing.

Apricots will be the principal fruit for curing this month. See that the fruit is perfectly ripe before picking; then cut them evenly, fumigate and put them out in the sun with as little delay as possible. Do not cure them too much, but take them in whilst yet quite pliable—after most of the moisture has left them. Pamphlets on curing fruit may be had on application to the Department of Agriculture. These will give all details in connection with this important work.

Cultivation.

All orchard land should be kept free from weeds, and to this end the horses and cultivators should have but little rest this month, as an orchard neglected for a few days will soon be covered with a coating of summer grass which will take many a hard day's work to eradicate, and couch grass spreads rapidly when left undisturbed. Where there are bad patches of couch grass, they should be ploughed up and harrowed on a very hot day, as the roots soon die when exposed to the sun.

Passion-Vines

which have been properly pruned and manured during November, will now be putting on good growth and blooming freely. This fruit will be ready to meet the demand at Easter, when it usually finds a ready sale at good prices.

Pineapples.

In tropical districts pineapples may be planted if moist weather prevails. Suckers are the best to plant, being much the strongest and earliest to arrive at maturity. Being great feeders, a dressing of strong nitrogenous fertiliser will promote rapid growth and fine fruit. While the plants are young cultivation must be thorough, but not deep enough to cut the feeding roots, which are near the surface.

Bananas and other tropical fruit may be planted during the rainy season.

Thinning Fruit.

In nearly every orchard are found trees which are apt to overbear, or which carry heavy crops every alternate year, while during the off year they set very little fruit. During the plentiful year the tree is so weakened that it requires a year's rest before it is in condition for carrying a crop. It would be better, therefore, if we used every means to regulate the cropping; that is, by judicious thinning to help the tree carry yearly crops of good fruit, in place of heavy crops of indifferent fruit every other year and very little during the off year.

In order to obtain the fruit which is most sought after by exporters as well as for the local trade, we must have medium to large fruit, of good colour and flavour, and this we seldom get from a tree which is allowed to overbear, so that it is best to resort to heavy pruning during the winter previous to the summer when a heavy crop is anticipated. If it is found that the tree still sets more fruit than it can properly mature, it is best to remove a fair proportion from the tree. In some cases as much as half of the fruit requires to be taken off. This thinning should take place as soon as possible after the pits harden in stone fruits, while apples may be thinned towards the latter part of November in the cooler districts, and a little earlier in the warmer districts. Picking and destroying moth-infested apples and pears should always be practised.

Loquats require thinning soon after they are well set if the largest fruit is to be expected.

Peach Tip Moth.

Peach tip moth has been doing more or less damage in orchards in the suburban districts between Parramatta, Ryde and Petersham, and Inspector Gallard, who has been giving special attention to it, reports that, in addition to peaches, he has found it attacking nectarines badly, plums and apricots slightly, and quinces and apples occasionally.

The life-history of the pest may be given briefly. The moth lays its eggs on the young tender shoots. When the grub hatches it eats its way down the centre of the shoot until it is fully developed, at which stage it eats its way out through the side, and seeks to shelter and pupate. The top of the shoot then droops over and dies off as if it were scalded.

When stone fruit is attacked, the grub eats its way into the green fruit, sometimes before it is half grown, and causes the gum to exude and stick the fruit together. When it is the limbs that are attacked, the gum oozes out at the end of the affected branch, and causes a gummy swelling. In the cases of quinces and apples the attack is chiefly on the fruit, and the number of grubs may vary from one to half a dozen. Unlike the codlin grub, the peach tip grub is not satisfied with eating the pips, but riddles the fruit through and through, leaving it totally worthless.

They take shelter in bandages just as readily as the codlins do, and the inspector referred to estimated that last season two-thirds of the grubs he took out of many of the bandages on apple and quince treas were the larvæ of this moth.

Where the attack is upon fruit it is believed that spraying with arsenate of lead, in the same way as for the codlin moth, will prove effective; and the fact that the grubs are found in the bandages on apples suggests plainly that bandaging on other trees for these grubs is worth trying.

CLEARING WITH EXPLOSIVES.

MR. GEORGE MARKS, Inspector of Agriculture, gave a demonstration during October at Nimbin in clearing land with explosives. One of the stumps dealt with was a mahogany butt, 9 feet in diameter. It was considered that to take this stump out by ordinary methods would entail a cost of £2. With 5 lb. of gelignite, distributed in five 1 lb. charges, it was lifted bodily out, bursting into four or five sections. Several similar stumps and trees were blown out with equally good results. The audience, consisting of a number of local farmers, expressed themselves very well satisfied with the demonstration.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

Carbide in the Orchard.—"C.D.": Yes; spent carbide, if dug into the ground around the young trees, is an advantage, as white ants rarely stay in the ground where the carbide has been applied. During the dormant season of the trees, the carbide may be made into a wash with water and swabbed on the tree trunks.—W. J. Allen.

Cow with Sore Eye.—"W.L.": The veterinary officers are of opinion, from your description, that the cow is suffering from cancer of the eye, and they recommend you to report the matter to the District Stock Inspector, or to get a qualified veterinarian to examine the animal.

Fodders for Irrigation.—"C.M." (Jerilderie): Yellow Dent and Early Leaming would be the two best varieties of maize for the purpose. Early Amber Cane is the most suitable of the sorghums for inland cultivation, although, with the aid of irrigation, Planter's Friend might also be worth a trial.—George Valder.

Calf Food.—"P.G." asks what is the best and cheapest food for calves reared by the hand from the commencement, until they are able to do for themselves.

Separated milk, to which may be added cocoanut oil cake at the rate of 2 ounces for each young calf, makes a good food for calves whilst very young. The oil-cake should be dissolved in hot water, and then added to the separated milk, and the whole fed while warm. When the calves have got a little older, the amount of oil-cake may be increased, or better still, crushed oats may be given if it is available.—M. A. O'Callaghan.

Destoying Stumps with Acids.—"A. H.C." refers to paragraph in September *Gazette*, page 786, and asks would these acids destroy green stumps, and should the auger hole be near the ground.

The acids are only used, as a rule, for dry stumps. They have some effect on green stumps, but it is not, as a rule, a satisfactory way of treating them. It would be better to ring these, and poison with arsenite of soda.

There is no necessity to put the hole near the ground; all that is necessary is that the hole should be sloping downwards.—George Valder.

Breakwind for Vegetable Garden.—"E. A.F." (Cooma). It is doubtful if tree lucerne would be hardy enough for such a cold district, but you might try a small quantity. Two good hardy hedge plants recommended by Mr. Maiden, Government Botanist, are Privet (*Ligustrum vulgare*) and Barberry (*Berberis vulgaris*).—George Valder.

Concrete from Soft Sandstone.—"J.B." (Ourimbah): Extremely soft stone does not make good concrete for such work as foundations, but would do for floors or concrete blocks. If it is broken to 1½ or 2 inch gauge, there would be a fair proportion of sand, which should, however, be screened out over a ¼-inch screen. All that passes through the screen may be classed as sand. About 11 cubic feet of sand should be mixed with 2 cubic feet of stone.

If required for small quantities, a simple way to ascertain the quantity of sand required is to use two kerosene tins. Fill one with stone; then pour into this as much water as the tin will hold (the stone will absorb a lot); then pour off the water into the second tin, which will show the quantity of sand required to fill all the voids or spaces in the stones.—A. Brooks.

Cement Floor in Hay-shed.—"H.H.B." is flooring a hayshed 40 feet x 40 feet. He has filled the bottom 3 inches with stone broken to 2 inches, and wishes to finish the top inch with Portland cement and sand; but cement is dear, and he asks the greatest proportion of sand which could be used; also whether lime, instead of cement, would make a durable floor.

Lime mortar, made of 3 parts sand to 1 part unslaked stone lime, may be used as a grouting to fill up the spaces in the stone filling; after which top-dress with 2 parts sand to 1 part cement, laid on ½ inch thick and hand-trowelled over, finishing off with a wood float, not the steel trowel. Keep the finished work wet for a week, until thoroughly hard. The cement dressing should go on as soon as the lime sets.—A. Brooks.

Insects on Orange Trees.—"C.R." : The Brown Scale (*Lecanium oleæ*) is the common "black bug" of the orange, and when the adult dies she simply forms a dry shield over the eggs produced from her body. When hatched, the tiny larvæ crawl from underneath the dead mother, and start fresh scales wherever they settle down. The insect sent is the grub of a moth that is feeding upon the scale.—W. W. Froggatt.

Second-Crop Potatoes.—"G.W." : In districts where it is possible to grow two crops of potatoes each year, portion of the early crop can be used to supply seed for the late crop. It is not essential that the seed be fully matured, but the tubers should be hardened off previous to planting, by exposing them to light, by spreading thinly on the floor of an open shed. Only whole potatoes should be used when planting the second crop.—A. J. Pinn.

Improving Washed-out Land.—"C.L." has a good red soil wheat paddock, from patches of which the top soil has been washed away. There are also white, cementy patches on the farm.

Soil of this washed-out kind should be broken up by applying lime at the rate of from ½ ton to 1 ton per acre. Its condition would also be much improved by adding vegetable matter, either by ploughing in a crop, or by distributing over it farm-yard manure, waste straw, or other material of this kind, and then ploughing it in.

Lime should be applied in the autumn or early winter, and the manure can be applied a month or so afterwards. The same treatment would be beneficial to the white, cementy patches.—George Valder.

Insects on Peach-trees.—"R.G.D." : The insects are the larvae of our common Red-spotted Ladybird beetle (*Leis conformis*). They are feeding upon aphis on the peach-tree foliage, and are friendly insects.—W. W. Froggatt.

Osteo-malacia (Bone-chewing) in Cattle.—"H.W.C." (Lawrence), referring to article in October *Gazette*, page 885, asks whether placing lime in water troughs in the paddocks would not prevent or cure the disease, and be less costly, than to supply the sterilised bone lick.

Sterilised bone meal may be obtained in Sydney at about 5s. per cwt., but any bone meal which has been subjected to heat may be used—in fact, the farmer could grind up bones himself and heat them, and use them with safety. They would, of course, require to be subjected to heat for some hours, but if the farmer lives in a district free from anthrax, there is very little need to heat at all. The placing of lime in the water would not be nearly so beneficial as supplying bone-meal, because the animal would not receive any phosphates, which appear to be as much needed as the lime, and the amount of lime taken up in that way by water is not great. Still, it should have some beneficial action.—Veterinary Officers.

Sheep Dying after Shearing.—"C.C." : The disease from which the sheep are dying is tetanus. The germs of the disease enter the wounds made by the shears. Keep a supply of Stockholm tar in the shearing-shed, and smear some over the cuts to protect the wounds from infection. A pamphlet on the disease has been sent to you.—Veterinary Officers.

Identification of Plants.—"W.J.M." (Dapto).—No. 1 is *Linum marginale*, A. Cunn., "Australian Flax-plant," a native of Australia. No. 2 is *Phalaris minor*, Retz., "Lesser Canary Grass," a native of Europe and a fair pasture grass. No. 3 is too imperfect; grasses should be sent when they are in flower. No. 4 is *Silene gallica*, Linn., "French Catchfly," a native of Europe, a useless weed.—J. H. Maiden.

Diseased Orange Leaves.—"W.J.M." : The orange leaves are not attacked by any insect or fungous disease; it is some organic disease, due probably to the soil, season, or roots. If only some of the leaves are damaged thus, the trees will probably outgrow it.

The fly sent is one of our small cicadas (locusts), which in the larval state live on the roots of shrubs and trees many feet underground. It is a small squeaker (*Melampsalta infans*). They may do a little damage among fruit-trees by cutting the twigs when laying their eggs, but can hardly be called a pest.—W. W. Froggatt.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	....	....	Berry	*
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
" ...	Imperialist ...	Florio	Lady Nancy of Minembah.	" "	*
" ...	March Pansy ...	Earl March ...	Australian Pansy	Grafton Farm ...	* *
Jersey ..	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
" ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	" "	*
" ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
" ...	Jamaica Jack ...	Sir Jack .	Rum Omelette (imp.).	Wollongbar Farm	*
" ...	Royal Blood ..	Berry Melbourne	Calceolus ...	" "	*
" ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ...	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Cowra Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ..	Vivid (imp.)...	Swan Bay... ...	22 June, '13.
" .	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Kyogle	28 Feb., '13.
" ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Maclean	15 Jan., '13.
" ..	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Grafton	3 April, '13.
" ..	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	H.A.College, Richmond	*
" ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
" ...	Sunshine ..	King of the Roses	Princess Vivid	Grafton Farm ..	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
" ...	Claudius .	Golden Star II..	Claudia's Pride (imp.).	Tweed River ..	12 Feb., '13.
" ..	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes	Berry Farm ...	*
" .	Good-bye .	Western Duke...	Souvenir (imp.)	Casino	1 May, '13.
" ...	The Peacemaker	Calm Prince ..	Rose Petersen	Jones' Island ...	1 June, '13.
" ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Pambula	1 May, '13.
" ...	Lauderlad ...	Laura's Boy ..	Souvenir of Wollongbar	Lismore	3 Jan., '13.
" ...	Royal Preel ..	Itchen Royal ..	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 May, '13.
Ayrshire ...	Jamie's Heir ..	Jamie of Oakbank	Miss Prim	Wollongbar Farm.	*
" ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
" ...	Orphan Boy .	Songster of Greystanes.	Rosamond	Glen Innes Farm..	*
" ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A.College, Richmond	*
Kerry... ..	Kildare II .	Kildare (imp.) ..	Belvedere Bratha 3rd (imp.).	" "	*
"	Bratha's Boy ...	Aicme Chin (imp.)	Bratha 4th	" "	*
"	Rising Sun ...	Bratha's Boy ...	Dawn .	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

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Department of Agriculture,
Sydney, 2nd December, 1912.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORNS.—Royal Success: sire, Royal Hampton 10th (imp.); dam, Waratah; calved 10th October, 1910; colour, red. Price, **£80.**

Waratah is by Dora's Boy from Australian Pansy. Australian Pansy was by Airy Knight 2nd from Pansy 4th (imp.) Dora's Boy was by Cornish Boy (imp.), from Lady Dora (imp.)

Waratah yielded 5,305 lb. of milk last season, testing 3·6 per cent., or equal to 223 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter fat. Lady Dora (dam of Dora's Boy) gave 9,560 lb. of milk in 265 days.

This bull combines the successful Dora's Boy and Pansy blood.

Duke of Hampton: sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

GUERNSEY.—Belfast: sire, King of Roses (imp.); dam, Flaxy 2nd; calved 20th September, 1911; colour, lemon and white. Price, **£40.**

Flaxy 2nd is by Rose Prince (imp.) from Flaxy (imp.). Flaxy (imp.) in thirty-seven weeks gave 6,443 lb. of milk, which it is estimated produced 334 lb. of butter. Flaxy 2nd developed a habit of sucking herself, and the only record shows 3,333 lb. of milk, testing 5 per cent.

HOLSTEINS.—*Robert the Devil: sire, Foxfield Chevin Bob (imp.); dam, Miss Muller; calved 14th February, 1912. Price, **£15.**

Miss Muller is by Hollander from Margosa. Margosa is by Garfield (imp.) from Maggie Obbe. Maggie Obbe is by Obbe (imp.) from Margaretha (imp.)

***Bobs:** sire, Froxfield Chevin Bob (imp.); dam, Margaret Anglin; calved 5th April, 1912. Price, **£12.**

Margaret Anglin is by Hollander from Margosa.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Beaucaire's Baby: sire, Monsieur Beaucaire; dam, Rosey of Wollongbar; calved 28th March, 1911. Price, **£40.**

Captain Rose: sire, Monsieur Beaucaire; dam, Parson's Red Rose 2nd (imp.); calved, 25th December, 1911. Price, **£35.**

Monsieur Beaucaire is by Calm Prince from Flaxy (imp.) Calm Prince was by Rose Prince (imp.) from Gentle (imp.). Parson's Red Rose yielded 4,860 lb. of milk in a lactation period, equal to 268 lb. of butter.

*** Applications for these bulls will be held till 21st December, 1912. If more than one application be received for any one bull, his disposal will be decided by ballot.**

BULLS FOR SALE—*continued.*

AT WOLLONGBAR EXPERIMENT FARM—*continued.*

GUERNSEY.—St. Michael of Wollongbar : sire, Trequean Mike (2103); dam, Polly 2nd of Roque Balan (imp.); calved 21st August, 1911. Price, **£40**.

Polly 2nd of Roque Balan (imp.) yielded 4,157 lb. of milk, equal to 235 lb. of butter.

AYRSHIRE.—Old Jock : sire, Jamie's Heir; dam, Auchen Dandy; calved 22nd November, 1911. Price, **£15**.

Auchen Dandy is by Daniel (imp.) from Dandy of Rattenraw (imp.). She yielded 4,273 lb. of milk on her second calf, equal to 216·5 lb. of butter.

H. C. L. ANDERSON, Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	M. A. Brown	Jan. 15, 16
Gosford and Brisbane Water A. and H Association	R. J. Baker	,, 24, 25
Kiama A. Association	G. A. Somerville	,, 24. 25, 27
Wollongong A., H., and I. Association	M. A. O'Donnell	,, 30, 31, Feb 1.
Berry A. Association	C. W. Osborne	Feb. 5, 6
Alstonville A. Society	W. M. Monaghan	,, 11, 12
Tamworth P. and A. Association	J. R. Wood	,, 11, 12, 13
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 12, 13
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 13, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	,, 18, 19, 20
Cobargo A., P., and H. Society	T. Kennelly	,, 19, 20
Wyong A. Association	J. H. Kay	,, 20, 21, 22
Central Cumberland A. and H. Association	H. A. Best	,, 21, 22
Dapto A. and H. Society	J. H. Lindsay	,, 25, 26
Bangalow A. and I. Society	W. H. Reading	,, 25, 26, 27
Armidale and New England P., A., and H. Assoctn.	A. McArthur	,, 25-28
Campbelltown A. Society	F. Sheather	,, 26, 27
Gulgong A. and P. Association	D. H. Spring	,, 26, 27
Gunning P., A., and I. Society	J. R. Turner	,, 26, 27
Manning River A. and H. Association (Taree)	S. Whitbread	,, 26, 27
Tumut A. and P. Association	T. E. Wilkinson	,, 26, 27
Armidale and New England P., A., and H. Assoctn.	A. McArthur	,, 26-28
Inverell P. and A. Association	J. McIlveen	,, 26, 27, 28

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1913.

Society.	Secretary.	Date.
Robertson A. and H. Society	J. D. Wood	Feb. 27, 28
Northern A. Association (Singleton)	E. J. Dann	,, 27, 28, Mar. 1.
Nepean District A., H., and I. Society (Penrith)	P. J. Smith	,, 28, Mar. 1.
Southern New England P. and A. Association, Uralla.	W. McCrossin	Mar. 4, 5
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 4, 5, 6
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 4, 5, 6
Bega A., P., and H. Society	W. A. Zingel	,, 5, 6
Braidwood P., A., and H. Association	L. Chapman	,, 5, 6
Camden A., H., and I. Society	A. Thompson	,, 5, 6, 7
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 5, 6, 7
Newcastle A., H., and I. Association	C. W. Donnelly	,, 5, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 6, 7
Port Macquarie and Hastings District A. and H. Society	T. Dick	,, 6, 7
Blayney A. and P. Association	H. R. Woolley	,, 11, 12
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge	,, 11, 12, 13
Bombala A. Society	W. G. Tweedie	,, 12, 13
Molong P. and A. Association	W. J. Windred	,, 12
Macleay A., H., and I. Association	E. Weeks	,, 12, 13, 14
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 12, 13, 14
Goulburn A., P., and H. Society	G. G. Harris	,, 13, 14, 15
Gundagai A. Society	A. Elworthy	,, 18, 19
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 26, 27
Cooma P. and A. Association	C. J. Walmsley	April 2, 3
Coonabarabran P. and A. Association	G. B. McEwen	,, 2, 3
Bathurst A., H., and P. Association	J. Bain	,, 2, 3, 4
Hunter River A. and H. Association	E. H. Fountain	,, 2–5
Wauchope P., A., and H. Society	A. D. Suters	,, 3, 4
Cobar P. and A. Association	D. H. Dunlop	,, 5, 6
Adaminaby P. and A. Association	W. Delaney	,, 9, 10
Gloucester A. H. and P. Association	S. J. Bignell	,, 9, 10
Clarence P. and A. Society (Grafton)	G. N. Small	,, 9, 10, 11
Orange A. and P. Society	W. Tanner	,, 9, 10, 11
Dorrigo A., H., and I. Society	W. R. Colwell	,, 10, 11
Moree P. and A. Society	D. E. Kirkby	,, 15, 16, 17
Dungog A. and H. Association	C. E. Grant	,, 16, 17
Merriwa A. and P. Association	V. Budden	,, 16, 17
Upper Manning A. and H. Association (Wingham)	D. Stewart, junr	,, 23, 24
Warialda P. and A. Association	A. J. Devine	,, 23, 24, 25
Deniliquin P. and A. Society	L. Harrison	July 17, 18
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	Aug. 19, 20, 21
Germanton P., A., and H. Society	J. S. Stewart	Sept. 3, 4
Young P. and A. Association	T. H. Tester	,, 9, 10, 11
Cowra P., A., and H. Association	G. S. Fisher	,, 16, 17
Murrumburrah P. A. and I. Association	J. A. Foley	,, 23, 24

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